INTERNATIONAL
Railway Journal

DECEMBER, 1961

Marché commun: Nouvelle politique des transports

Gemeinsamer Markt sucht neue Transportpolitik

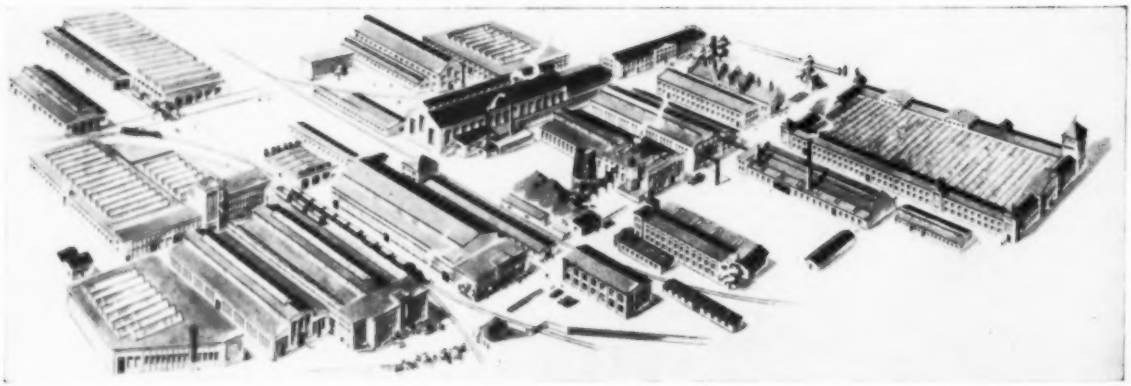
Estudio del Mercado Común Nueva Política de Transporte

00 £0.7.2 A Railway Age Publication

We manufacture and supply:

Passenger train coaches
Battery and diesel railcars
Freight cars of every type
Articulated tramway sets
Double-deck buses
Underground train sets

20/1/61



In our extensive manufacturing facilities, short distance transport equipment and railway vehicles for passenger and freight transportation are built both for intercity carriers and municiple transportation systems.
The competence of our staff and the application of up-to-date means of production are our guarantee of good performance. The fact that our products go around the world is proof of Berlin quality.

DWM

Deutsche Waggon- und Maschinenfabriken GmbH
Berlin-Borsigwalde
Telefon 49 00 15
Fernschreiber 018 3822
Telegramm-Adresse DEWUMA Berlin

The electrical equipment of diesel-electric locomotives — and, for that matter, traction equipment generally — sets the designer particularly stiff problems in terms of reconciling the various and often conflicting demands for high power. Absolute reliability must be ensured in the most difficult circumstances, yet strict limitations of size and weight must be observed. There are no text book answers to such problems. Their solution depends very largely on experience; or having tackled the same kind of problem many times before. If you like, on . . .

This thing called know-how

Consider the field coils of the generators on British Railways Type 3 diesel-electric locomotives. These generators, which combine three separately wound machines into a single frame, absorb 1,550 h.p. of engine output, yet are incredibly compact, and this compactness is reflected in the extremely close spacing of the field coils. Each of these coils is in fact precision-formed; bakelized and hot-pressed under close control. The result is more like a structural part than a coil. A hard, coherent body, with a high insulation value in which the conductors are embedded; massively strong, and completely immune to water and dirt. In the magnet frame both main and interpole coils, similarly built, fit snugly together so that all the available space is employed. This construction, which saves space and weight and at the same time provides great reliability, is one of those details in which experience—80 years of it in our case—comes into its own.

Crompton Parkinson LIMITED

TRACTION EQUIPMENT

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, Transformers, Switchgear, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

TRACTION DEPT., CHELMSFORD, ESSEX, ENGLAND. Tel: Chelmsford 3161 'Grams & Cables: Crompark, Chelmsford

TE613

METRO-CAMMELL

DIESEL ELECTRIC PULLMAN TRAINS

FOR BRITISH RAILWAYS

* INTEGRAL TUBULAR CONSTRUCTION
* QUIET RIDING
* METRO-SCHLIEREN BOGIES
* ADJUSTABLE RECLINING SEATS
* AIR-CONDITIONING
* SPECIAL GANGWAYS

DESIGNED AND BUILT FOR THE PULLMAN CAR CO. LTD. BY

METROPOLITAN-CAMMELL CARRIAGE & WAGON CO. LTD.

HEAD OFFICE SALTLEY BIRMINGHAM 8 LONDON OFFICE VICKERS HOUSE BROADWAY WESTMINSTER S.W.1

December 1961

Editorial Offices:
Lange Poten 29, The Hague, Netherlands
Postbox 305, Tel. 18 37 82,
Cable SIMMBOARD

Executive Offices:
30 Church St., New York 7, N.Y., U.S.A.

MANAGING DIRECTOR ROBERT G. LEWIS

Publisher ..... Gordon Huffines
Executive Editor ..... J. W. Kizzia
Editor ..... Paul Goldsack
Art Editor ..... Joel Petrower

Regional Editors:
London ..... Robert Spark
Sydney ..... F. A. Drew
Bogota ..... Carlos Ricuarte Samper
Moscow ..... Nikolai Fufriansky
Mexico City ..... Francisco Procel
Tokyo ..... Alan B. Clapford
Manila ..... P. S. Estayo
Istanbul ..... Wm. D. Middleton
New Delhi ..... Krishen Ghulati
Hong Kong ..... Takashi Oka
Cape Town ..... Peter Hjul
Editorial Assistant ..... Baukje C. Westra
EDITORIAL DIRECTOR .. JAMES G. LYNE

ADVERTISING SALES

LONDON S.W. 1, ENGLAND
Max F. Holsinger,
Director International Operations
R. N. Lees
A. T. Chapman-Purchas
67/68 Jermyn Street, St. James's.
Telephone: TRAfalgar 6318

Northern Office:
Philip King,
11 Tewit Well Rd.
Harrogate, Yorks.
Telephone: Harrogate 69212

DÜSSELDORF, GERMANY
G. W. Rohde
Erich Hillerbrand
Hüttenstrasse 17, am Ernst-Reuter-Platz
Telephone: 14904

NEW YORK 7, N.Y., U.S.A.,
Duane C. Salisbury,
Executive Vice President-Sales,
30 Church St.,
Telephone: WOrth 4-3060

CHICAGO 3, ILL.
79 W. Monroe Street
Telephone: RAndolph 6-0794

International Railway Journal

VOL. I PUBLISHED MONTHLY IN THE NETHERLANDS NO. 11

Europe: EEC Maps New Transport Policy ..... p. 20
Europe: TEEM Trains Cut Schedules ..... p. 23
Holland: Werkspoor Builds New Trainset ..... p. 24
South Africa: Track Maintenance Mechanized ..... p. 28
Australia: New Line Under Construction ..... p. 33
Switzerland: CFF Builds New Berne Station ..... p. 34
Spain: Talgo - the First 10 years ..... p. 41
France: Channel Tunnel Wins Support ..... p. 42
Japan: JNR Develops New Control System ..... p. 44
US: Erie-Lackawanna Mechanizes Spot-tamping p. 48
Britain: Electrification on the BR ..... p. 50

Departments

World Market ..... p. 7
World Report ..... p. 9
News Briefs in Pictures ..... p. 18
Products of Interest ..... p. 54
Advertisers' Index ..... p. 57
World Poll ..... p. 58
After Hours ..... p. 58

SUBSCRIPTION INFORMATION: Subscription correspondence may by directed to: Subscription Department, INTERNATIONAL RAILWAY JOURNAL, 30 Church Street, New York 7, N.Y., U.S.A. Changes of address should reach us three weeks in advance of the next issue date. Send old address with the new address enclosing, if possible, your address label. Subscription orders should include: (1) Your name and title or position; (2) name of firm and nature of business; (3) your complete mailing address.
SUBSCRIPTION PRICES: One year: $7.00 (US), £2.10.0 Sterling. Single Copies: $1.00 (US), 7/2d. Sterling. Payment may be made through INTERNATIONAL RAILWAY JOURNAL, c/o Sibley-Field Publishing Co., Ltd., 8/9 Clerkenwell Green, London E.C. 1, England; INTERNATIONAL RAILWAY JOURNAL, Postbox 305, The Hague, Netherlands; R. C. Van Ness, Circulation Manager, INTERNATIONAL RAILWAY JOURNAL, 30 Church Street, New York 7, N.Y., U.S.A.
COPYRIGHT, 1961, by Simmons-Boardman Publishing Corporation. Contents may not be reproduced without permission.

the JACKSON TRACK MAINTAINER 1962

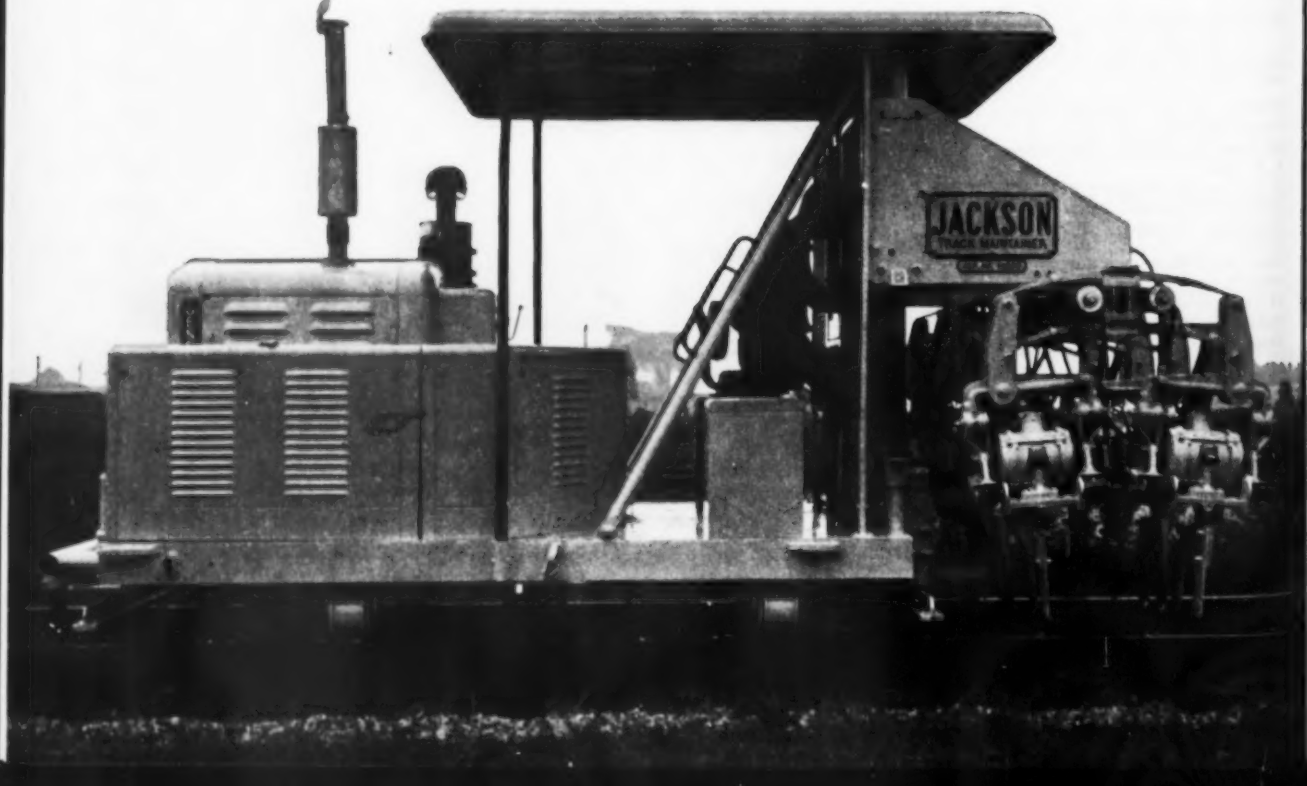
With these highly important improvements, the Jackson Track Maintainer continues to be unequalled in versatility and its ability to put up and maintain the finest track at the lowest cost per mile . . . **in any kind of ballast and lift of track.** Let us give you the complete facts.

- **MORE POWERFUL TAMPERS . . . FASTER PENETRATION**
- **FASTER WORKHEAD ACTION . . . FASTER INDEXING**
- **FULL ELECTRIC OPERATION WITH PUSH-BUTTON CONTROL**
- **IMPROVED SUSPENSION OF TAMPERS** provides direct application of greatly increased vertical and horizontal vibratory forces plus workhead weight.
- **POSITIVE MOTOR AND GENERATOR PROTECTION** against short circuits, single-phasing and low voltage.
- **FASTER, MORE POSITIVE BRAKING**

Complete push-button Control

JACKSON VIBRATORS, INC.
LUDINGTON, MICHIGAN

Available in U.S. 4 ft. 8½ in. (1.435 M) and wider gauges.



(Advertisement)

RÉSUMÉ

Grâce à de nouvelles améliorations, la machine Jackson pour l'entretien de la voie, Modèle 1962, reste inégalée en souplesse d'application et en sa capacité de levage et d'entretien des voies de la meilleure qualité, au plus bas coût par kilomètre—quel que soit le ballast ou le relevage de la voie.

•DES BOURREUSES PLUS PUISSANTES ... PENETRATION, ACTION DE BOURRAGE ET DISTRIBUTION PLUS RAPIDES ... MANIPULATION ENTIEREMENT ELECTRIQUE AVEC CONTROLLE A POUSSOIR ... SUSPENSION MEILLEURE DES BOURREUSES, permettant l'application directe d'une plus grande puissance vibratoire verticale et horizontale, à laquelle s'ajoute le poids de la tête de bourreuse ... PROTECTION POSITIVE DU MOTEUR ET DU DYNAMO contre les courts-circuits, le monophasé et le bas voltage ... FREINAGE PLUS RAPIDE ET PLUS EFFICACE.

Est livrable en écartements de 4'8½" (1,435M) et plus.

RESUMEE

Mit den folgenden wichtigen Verbesserungen ist das Jackson 1962 Gleisunterhaltungsmodell wiederum unvergleichlich in seiner Vielseitigkeit und seiner Fähigkeit, Gleise höchster Qualität zu heben und zu unterhalten und zwar in jeder Art Bettungsstoff und zum niedrigsten Kostenpreis pro Kilometer.

•KRÄFTIGERE STAMPFEN ... SCHNELLERE EINDRINGUNG ... SCHNELLERE STAMPFAKTION ... SCHNELLERE VERTEILUNG ... VOLLSTÄNDIGER ELEKTRISCHER ANTRIEB MIT DRUCKKNOPFKONTROLLE ... BESSERE AUFHÄNGUNG DER STAMPFEN. ergibt eine direkte Auflage von grösseren senkrecht und waagerecht vibrierenden Kräften mit zusätzlichem Stampfkopfgewicht ... POSITIVER MOTOREN- UND GENERATOREN-SCHUTZ gegen Kurzschlüsse, einphasige und niedrigere Spannung ... SCHNELLERES, POSITIVES BREMSEN.

Lieferbar in 4'8½" (1,435 M) und in breiteren Spurweiten.

RESUMEN

Gracias a los importantes adelantos que mencionamos a continuación, la Mantenedora de Vias Jackson para el 1962, sigue siendo la unidad sin paralelo en versatilidad y en capacidad para colocar y mantener las mejores vías al costo más bajo posible por milla ... *en cualquier clase de balasto y levantamiento de via.*

APISONADORAS MAS POTENTES ... PENETRACION MAS RAPIDA ... AVANCE MAS RAPIDO ... FUNCIONAMIENTO TOTALMENTE ELECTRICO CON MANDOS DE BOTONES ... LA SUSPENSION MEJORADA DE LAS APISONADORAS permite aplicar directamente fuerzas vibratorias mayores, tanto verticales como horizontales, además del peso de la cabeza de trabajo ... PROTECCION SEGURA DEL MOTOR Y DEL GENERADOR contra cortocircuitos, falla de fase y bajo voltaje ... FRENADO MAS RAPIDO Y SEGURO.

Puede obtenerse en modelos para vias de 1435 m ó más anchas.

JACKSON VIBRATORS Inc.

World Market

▶ *Argentina*—The Argentine Railways has ordered 70 all-purpose, 1200-hp diesel-electric locomotives from Montreal Locomotive Works at a cost of approximately $14,000,000 (Can.). The broad-gauge DL-535 units are scheduled for delivery in 1962.

▶ *Bolivia*—The ministry of public works is said to have under consideration a plan for rehabilitation of the Bolivian Railway Co. In prospect are possible purchases of locomotives, rolling stock, tools and spare parts, as well as track repair and roadway rehabilitation. Total cost of the program is estimated at $10,000,000 (US). The government may seek a loan from the US to finance the work.

Bolivia Railway has ordered six diesel-electric locomotives from General Motors Overseas. The new units, to replace steam, will be used on the Antofagasta–Colama line.

▶ *Great Britain*—The Scottish Region of British Railways has placed an order with Plasser Railway Machinery (GB) Ltd. for two lifting and levelling Plassermatic VKR-04 PX-10 tamping machines equipped with Meadows diesel engines.

▶ *Japan*—Railway rolling stock exports reached a record total, valued at $44,500,000 (US), in fiscal 1960, according to reports compiled by the Japanese Machinery Exporters' Association. Countries purchasing Japanese-built equipment included Argentina, India, Formosa, Brazil, South Korea, Panama, Peru and Malaya. The Philippines and Burma, major importers in earlier years, showed declines in 1960 as reparations programs from World War II were completed.

▶ *South Africa*—The South African subsidiaries of English Electric Co. and Wright Boag and Head Wrightson are combining in a joint venture to manufacture main-line electric locomotives. English Electric is spending R 400,000 on extension of its works in the Transvaal, and Wright Boag and Head Wrightson are expanding their structural and mechanical engineering works at a cost of R 500,000. During the past 10 years English Electric has delivered—from Britain—160 class 5E 2000-hp locomotives to the South African Railways.

▶ *Togo*—The Togolese Minister of Transport has announced that West German firms are to be awarded contracts for the extension of Togo's railway system. The railway was built in the former German colony by German firms in the period 1905 to 1909. Togo is also negotiating with the German Federal Railways for the training of Togolese railway personnel in West Germany.

▶ *West Germany*—The Federal Railways will order next year 180 passenger cars to be used primarily in commuter services. A total of 160 such units were ordered during the current year.

The German Federal Railways plan to bring its current fleet of 4000 sliding-roof cars up to 6000 units by the end of this year and to 7200 units by the end of 1962. Orders for 3200 cars to accomplish this have already been placed. Orders for an additional 750 cars are expected.

The railway equipment firms of Paul Schreck of Brunswick and Ferdinand Mieves KG Weichenbau of Dortmund have merged. The name of the new firm is Schreck-Mieves KG, with headquarters in Dortmund.

▶ *Yugoslavia*—The Duro Dakovic factory at Slavonski Brod will deliver 16 diesel locomotives to the Yugoslav State Railways by the end of 1961. The Duro Dakovic plant also announces completion of a prototype diesel-electric locomotive of 825 hp built under license from Brison & Lock of France. Serial production will be started after operational tests.

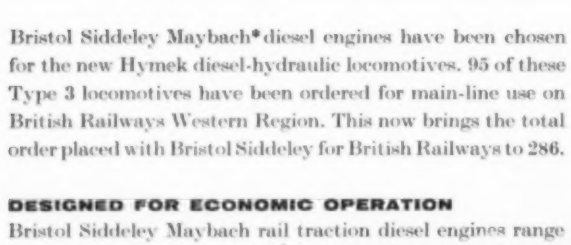
Bristol Siddeley Maybach diesels power the new Hymek locomotives

Bristol Siddeley Maybach* diesel engines have been chosen for the new Hymek diesel-hydraulic locomotives. 95 of these Type 3 locomotives have been ordered for main-line use on British Railways Western Region. This now brings the total order placed with Bristol Siddeley for British Railways to 286.

DESIGNED FOR ECONOMIC OPERATION

Bristol Siddeley Maybach rail traction diesel engines range from 384 to 2,000 hp and embody design features which produce more efficient operation in terms of lower wear, greater reliability and easier servicing.

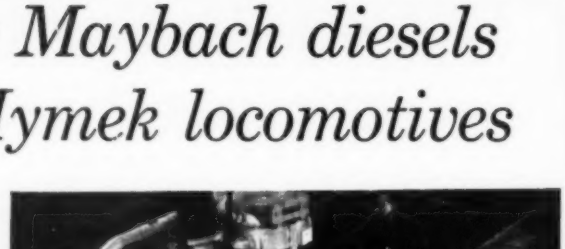
The immensely strong, roller bearing disc-webbed crankshaft, for example, is extremely rigid in its tunnel housing.



Disc-webbed, roller bearing crankshaft and tunnel housing

This results in very low main and big-end bearing wear. The pressure-oil cooling of the pistons gives effective heat dissipation which reduces liner and gas ring wear to a minimum.

Since the majority of components are identical in all models, spares stocks can be cut and servicing is simplified through interchangeability.



Maybach diesel engine being installed in D800 Class at Swindon.

WORLD-WIDE SERVICE

Maybach engines are in service all over the world, and have built for themselves an unsurpassed reputation as the most efficient diesel engines of today. This reputation, backed by the efficient Bristol Siddeley after-sales and spares service, offers the most satisfactory solution to all rail traction requirements.

For further information, please write to: Power Sales Manager, Power Division, Bristol Siddeley Engines Limited, PO Box 17, Coventry, England. Cables: Brisidair, Coventry.

**Manufactured in the UK under exclusive licence from Maybach-Motorenbau GmbH.*

BRISTOL SIDDELEY ENGINES LIMITED

TURBOJETS – TURBOFANS – TURBOPROPS – RAMJETS – ROCKET ENGINES
MARINE AND INDUSTRIAL GAS TURBINES – MARINE, RAIL AND INDUSTRIAL DIESEL ENGINES – PISTON ENGINES – PRECISION ENGINEERING PRODUCTS

WORLD REPORT

ANGOLA: The North British Locomotive Co. has delivered the first two of four 0-6-0 diesel-hydraulic shunters ordered by the Benguela Railway Co. The locomotives are powered by Paxman 8RPHXL diesel engines developing 425/350 hp at altitudes up to 1859 m. Drive is through a Voith-North British type L24v hydraulic transmission.

AUSTRALIA: Most of the £7,650,000 in loan funds allocated by the government to the Victorian Railways for the current fiscal year will be used for standard-gauge projects: £920,000 for the new Melbourne passenger terminal; £975,000 for a new diesel locomotive depot at Dynon; £140,000 on a standard-gauge overpass at North Melbourne; and £216,000 for grade separation between Melbourne and Albury. Expenditure on new suburban trains will total £1,100,000 and it is expected that six seven-car sets will be in service by the end of the year. The VR's share of expenditures on new air-conditioned sleeping car trains for the Sydney–Melbourne service will be about £382,000, or one-third of the total cost. Construction or rebuilding of freight cars in VR shops, including new cars for standard-gauge operations, will cost nearly £600,000. Some £300,000 has been allotted for 80 1.6-m gauge high-speed freight brake vans.

Coordinated Flexi-Van road-rail service is now being operated between Melbourne and Adelaide by the Victorian and South Australian Railways and two trucking firms. Four rail flatcars were built for the services by the SAR; the Flexi-Van equipment was supplied by an Australian subsidiary. Extension of the service to the Melbourne–Sydney route utilizing 22.2-m flatcars carrying two Flexi-Van units is envisaged following completion of the standard-gauge link.

AUSTRIA: With completion of electrification of the line from Vienna to the Italian border, some 30% of the total Austrian rail network is now electrified. Electrification of 50% of the 6600-km network is planned by 1970.

INDIA: Funds for railway expansion and development in 1962 will be provided, in part, by a loan of $50,000,000 (US) from the World Bank (IRJ, Nov., page 9). Railway development has been assigned an important place in India's Third Five-Year Plan, which began in April, 1961. It is estimated that railway purchases outside the country will total almost $400 million between now and 1966 (IRJ, Oct., page 9). Government-owned railway workshops will manufacture 10,000 broad-gauge freight cars annually during the Third Plan. The program calls for annual assembly of 2000 open cars with eight wheels and 55-ton capacity. The remaining cars, consisting of both open and closed units, will be four-wheel cars of 22-ton capacity.

The Third Asian Railway Conference was held in New Delhi last month. Subjects discussed included development of railways in an expanding economy; transport policy and coordination; and standardization of rolling stock and its local manufacture.

ITALY: The Italian State Railways is dieselizing its Sardinia lines. More powerful units will be required when the FS puts into operation its planned ferry service between Cagliari and the Orange Gulf on the east coast of Sardinia.

IRELAND: Coras Iompair Eireann is converting 9 diesel cars to powered intermediates. These are power cars without cabs which can be gangwayed to other cars. Normally CIE diesel trains on main-line services are made up into three or four-car sets with power cars with cabs at either end. Although two sets can be run in multiple-unit it is not possible for passengers to move from one set to another. The converted cars overcome this problem and a six-car set, for example, can now consist of a powered car with cab, a powered intermediate car, two trailer cars, a powered intermediate car and a powered car with cab.

FINLAND: With construction of a new railway line already in progress between Kauliranta and Kolari, the Finnish State Railways has announced a program for constructing additional trackage at other points. The Kauliranta–Kolari line will be 124 km. Other projects now in planning or undergoing field study include 159 km between Tampere and Seinäjoki; 8 km between Kovero and Heräjarvi; 95 km between Orkama and Parikkala, and 57 km between Jämsänkoski and Jyväskylä. The 27-km line, Lappeenranta to Luumäki, is to be straightened, and that work is underway. In addition, the railway expects shortly to open a new segment of trackage between Kontiomäki and Taivalkoski. Financing for these several projects has been authorized except for the Orkama–Parikkala and Jämsänkoski–Jyväskylä sections. Completion of the entire program will increase the State Railway network by approximately 10%.

FRANCE: Alsthom is proceeding, in collaboration with the Finnish railway supply industry, on the construction of a series of 2800-hp diesel-electric locomotives for the Finnish State Railways. These CC units will have "monomoteur" bogies equipped with variable gearing for use in freight or passenger services. Maximum speed in passenger service will be 140 km/h; for freight service, 100 km/h. Continious effort for passenger and freight operations will be 13,700 and 19,000 kg respectively. Each locomotive will be equipped with two MGO diesel engines (Type V16 BSHR) with outputs of 1400 hp at 1500 rpm. The locomotives will be 18.5 m long, and 3 m wide.

CONTINUED ON PAGE 11

GENERAL MOTORS LOCOMOTIVES

. . . scientific packaging protects parts in shipment and in storage!

This picture of a carton of exhaust valves goes a long way to explain what we mean by scientific packaging which protects General Motors locomotive parts both in shipment and in storage.

The carton itself is engineered for strength and light weight. No chance for parts to rattle around and become damaged during shipment or normal handling. And shipping costs are kept to a minimum.

VPI Wrap for rust prevention

All metal parts are packed with VPI, a paper that gives off a vapour which positively prevents corrosion. More than a decade of use has proved the effectiveness of this clean, lightweight vapour-phase corrosion inhibitor. Parts sealed in their cartons stay *factory-fresh!* And because there's no greasing or spray-coating required, the costly and involved process of degreasing is eliminated. Parts can be used immediately upon unpacking.

Exclusive skin packaging

Another development for protection of gaskets and other small parts is skin packaging. A transparent film, tightly vacuum-sealed over the contents, provides immediate visual identification without the package being opened. Gaskets retain natural moisture—won't dry out or shink even when stored for a year or more.

The thoroughness of General Motors parts packaging is worth keeping in mind when you are in the market for Diesel locomotives. It's one of the smaller, yet nonetheless important reasons why General Motors locomotives *cost less in the long run.*

GENERAL MOTORS OPERATIONS OVERSEAS

Division of General Motors Corporation,
New York 19, N.Y., U.S.A. · Cable Address: Autoexport

ASSOCIATE BUILDERS: AUSTRALIA—The Clyde Engineering Co. Pty., Ltd., Sydney, N. S. W. • BELGIUM—LaBrugeoise et Nivelles, St. Michel-lez-Bruges • GERMANY—Henschel-Werke, GmbH, Kassel SOUTH AFRICA—Union Carriage & Wagon Co. (Pty.) Ltd., Nigel, Transvaal • SPAIN—Material y Construcciones, S. A., Barcelona SWEDEN—Nydqvist & Holm Aktiebolag, Trollhattan

LOCOMOTIVE PLANTS: Electro-Motive Division of General Motors, La Grange, Illinois, U. S. A. General Motors Diesel Limited, London, Ontario, Canada

GENERAL MOTORS LOCOMOTIVES

General Motors subsidiaries. branches or representation throughout the world

World's Highest Standard—270 to 2600 H. P.

LIBERIA: A new, heavy-duty railroad, about 265 km (165 miles) long, is under construction in Liberia for transportation of iron ore. The new line will extend northeasterly from the seacoast at Buchanan, which is about 80 km (50 miles) southeast of Monrovia, capital of Liberia, into the Nimba Mountains, where new ore deposits are under development by LAMCO, a joint undertaking of the Liberian government and United States and Swedish steel companies. The deposits have been assayed as having some 235,000,000 tons of high-grade ore, plus 500,000,000 tons of reserves. First-stage production is expected to be about 6,000,000 tons per year, most of which will be exported to the United States and Western Europe through new deep-water port facilities being built at Buchanan. Total cost of the project is estimated at about $200,000,000 (US). Approximately one-quarter of this ($49,000,000) will be spent on the railroad and on the port, both of which are being built under contract by Raymond International, Inc., of New York. For construction purposes, Raymond recently shipped to Liberia from the United States six large and six small diesel locomotives and 195 standard and specialized railroad cars, most of which were purchased from the Lehigh & New England, a US railroad which recently ceased operations. The rolling stock, plus additional construction equipment, was carried by the "Seatrain New York," a specialized ocean-going vessel with built-in railroad tracks which normally carries freight cars between Atlantic Coast ports in the United States.

MEXICO: The National Railways estimate that traffic for 1961 will total 25,500,000 tons of freight and 29,500,000 passengers compared to 22,000,000 tons of freight and 27,000,000 passengers in 1961.

Mexico has entered the railway export market with National Railway Car Construction Plant outbiding US firms for a 16-car order from the Panama Canal Co.

NETHERLANDS: Dutch and Belgian railways will run three 1000-ton trains every 24 hours for the next three years carrying stone from Belgian pits for the piers of a new harbor at IJmuiden. The contract for transporting the necessary 2,000,000 tons of ore was won by the railways in the face of stiff competition from ship lines. Belgian Railways is providing 500 flat-cars with reinforced bottoms for the project.

RHODESIA: Tests conducted by the Rhodesia Railways show that passenger schedules on the 273-km Salisbury–Umtali line could be improved with diesel railcars. On the basis of tests conducted with a CFM railcar, the railway estimates that the trip, which now takes eight hours with diesel-hauled mail trains, could be cut to $4^1/_2$ hours.

SOUTH AFRICA: The last of 115 diesel-electric locomotives built by International General Electric Co. for the South African Railways has been delivered in Durban. These U18C1 Universal type units were ordered in 1958 at a cost of nearly R 20,000,000. Designated class 32 by the SAR, they are being used on the South West African system where conversion from steam to diesel traction is expected to be completed by the end of this year.

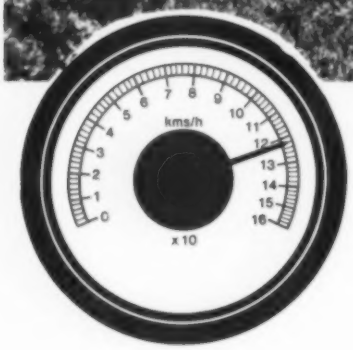
TURKEY: The general director of the Turkish State Railways has announced that some £700 million is needed for modernization of the nation's railway system. The present financial position, he stated, permits only minor improvements.

WEST GERMANY: The 1962 meeting of the International Railway Congress will be held in Munich, June 17–27. A program of visits to German Federal Railways' installations and to manufacturing facilities is being arranged for delegates.

DB has completed electrification of the lines between Wiesbaden Hauptbahnhof and Oberlahnstein (90 km), and between Hanau Hauptbahnhof and Fulda Hauptbahnhof (85 km). Electrification of the stretch between Oberlahnstein and Coblence Hauptbahnhof is scheduled to be completed by 1 Feb., 1962, and the stretches from Oberlahnstein to Cologne and Beuel to Coblence during the winter of 1962–63.

DB increased its roster of rolling stock by 103 locomotives and 4885 freight cars in the first half of 1961. According to a report received from the railroad, a total of 152 passenger cars also were added during this period. The new locomotives included 54 electric, 30 roadway diesels and 19 shunting units. As a result of these deliveries, the railway's motive power roster totaled 9073 units, of which 6998 were steam, 1065 electric and 1010 diesels. A total of 4060 km of line has been electrified and a goal has been set to increase the electrified territory to 8500 km. This will represent only 28% of the federal system, but 70% of all traffic is said to be concentrated on these lines. Freight cars on the German Federal system totaled 267,000 units in mid-1961, while passenger cars, all types, totaled 22,319. The number of specially equipped freight cars has been increasing rapidly. At present, 15% of the freight cars are in this category; an increase to 18.7% is planned during 1962.

Henschel-Werke GmbH has announced that a 4000-hp diesel hydraulic it is developing as a prototype for the largest of the standardized German Federal Railway road units will be made available for testing by US railways. The locomotive will be powered by a pair of supercharged Daimler 16-cylinder, V-type diesel engines. The 133-ton locomotive, which DB designates as its Type V320, is equipped with a pair of three-axle trucks. Each truck is individually powered by one of the engines through a Voith hydraulic transmission.



120 kms/h within 100 seconds!

electric four-car trainset for Netherlands Railways

- integral tubular construction
- very low metre weight of 1630 kgs/m with 200 tons buffingload
- smooth riding qualities owing to famous Werkspoor bogies
- high acceleration
- modern interior
- pressure ventilation and heating
- modernized gangways
- seating capacity for 281 passengers

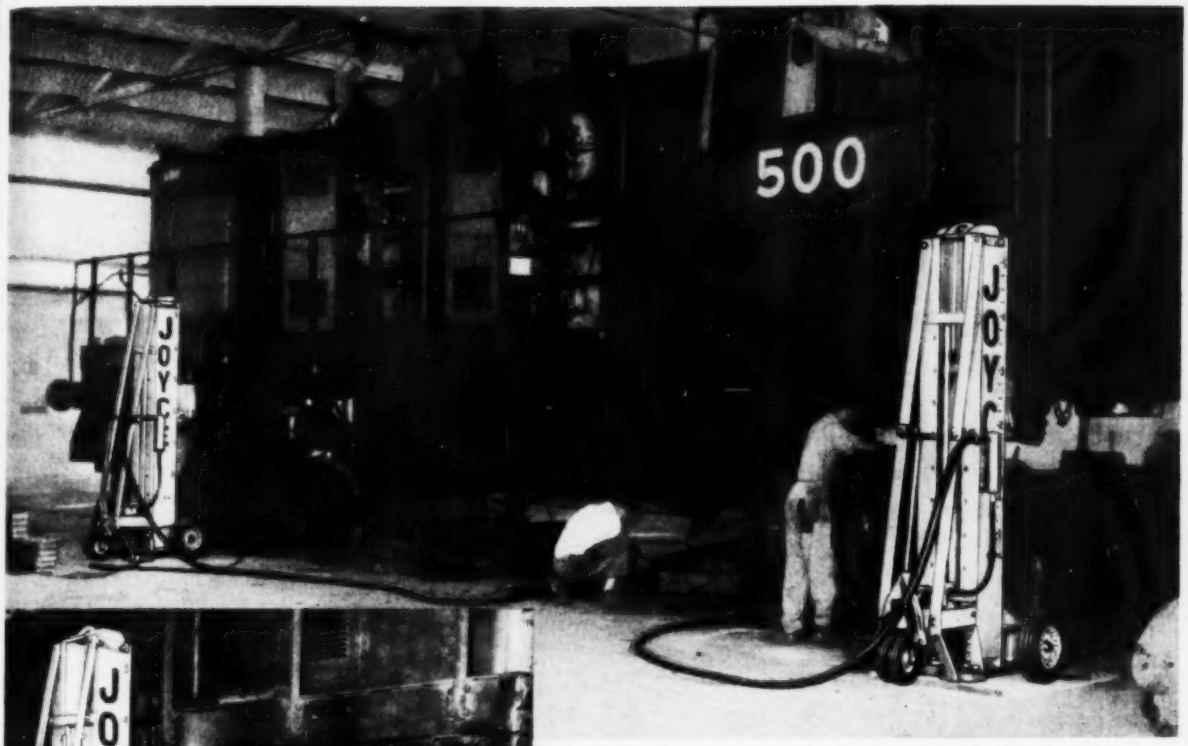
Designed in co-operation with the Netherlands Railways and the Dutch electrical industries

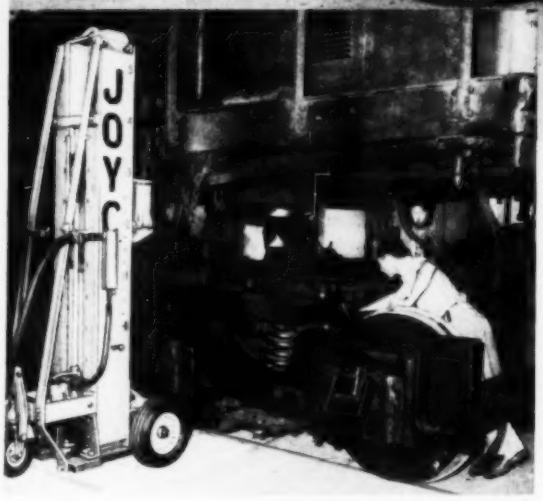
WERKSPOOR

UTRECHT WORKS (HOLLAND)

V·M·F

Baudoin





Four synchronized Joyce 35-AHL Jacks lift diesel locomotive free of trucks. Air operation through multiple-valve arrangement assures level rise.

Closer view shows how locomotive body can be lifted entirely off trucks. Four jacks could also be used to lift locomotive, trucks and all, entirely off track.

JOYCE ALUMINUM, AIR-OPERATED SHOP JACKS

speed service on diesel locomotives and all railroad cars

A satisfied customer states:
"... the Joyce Model 35-AHL compressed air jacks each of 35 tons capacity, which we purchased, are fulfilling expectations and are perfectly adapted to the services to which they have been put on this railroad."
Oscar Funes
Ing. Sub-Jefe del Departamento de Locomotoras
ESTRADA DE FERRO ARARAQUARA

Features of joyce 35-AHL jacks:

One-Man Operation... lightweight aluminum alloy construction saves weight. Three wheels equipped with semi-pneumatic tires make trundling and positioning of the jack an easy one-man job.

Air Motor Operated... for safety, convenience and labor savings.

Can be Synchronized... jacks can be used singly... or 2, 3, or 4 jacks can be synchronized through multiple-valve arrangement for positive level lifting.

Built-In Safety... jack stops automatically at top and bottom of rise... automatically locks under load in case of air failure. Low center of gravity gives jack excellent stability.

Specifications... 35 tons capacity... 4 ft. $4^1/_2$ inches rise... weight 1620 pounds... operates on 90 PSI pressure.

Write for complete information

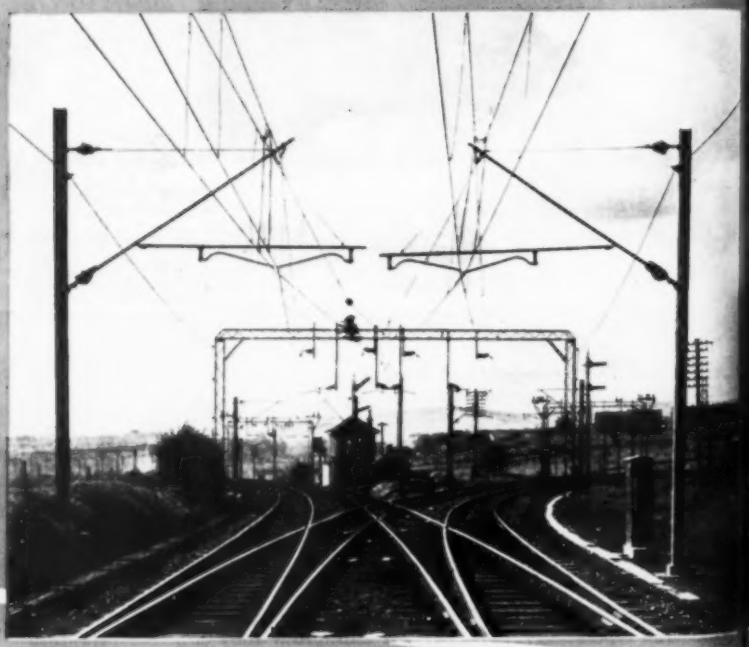
THE JOYCE-CRIDLAND COMPANY
Baldwin-Lima Hamilton Corp., Export Department, Philadelphia 42, Pa., U.S.A.

the permanent way of the future

Pirelli-General Overhead Lines Department undertakes complete railway overhead electrification schemes, inclusive of survey, design, supply and construction.
Illustrated here is equipment erected by Pirelli-General for British Railways, Scottish Region, showing sections of the 180 single-track miles of 25/6.25kV A.C. single-phase overhead line for the Glasgow Suburban Stage 1, electrification scheme.

RAILWAY ELECTRIFICATION

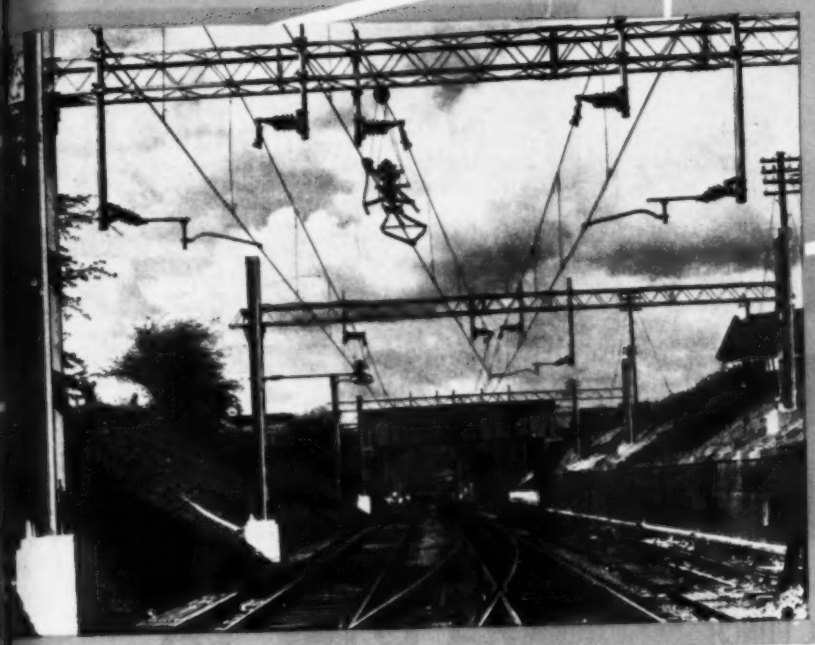
FOR POWER
LIGHTING
SIGNALLING
COMMUNICATION



PIRELLI-GENERAL

best way to buy

PIRELLI-GENERAL CABLE WORKS LIMITED
SOUTHAMPTON & EASTLEIGH, ENGLAND



WITH PIRELLI GENERAL

P 7287

FULL SPEED AHEAD

with
BELL PUNCH
in
railway
booking offices

the ULTIMATIC

Successfully installed by British Railways and London Transport Executive, these machines can handle tickets of five different prices and colours. Every Ticket issued is simultaneously dated and recorded.

BELL PUNCH EXPORT CO. LTD

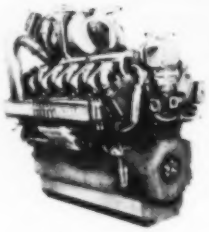
39 St. James's Street, London SW1
Cables: Belpunch London

CONTROL SYSTEMS PRODUCT

A member of the Lamson Industries Group

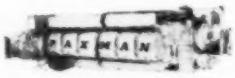
TODAY'S LEADING RAIL TRACTION DIESELS ARE

PAXMAN

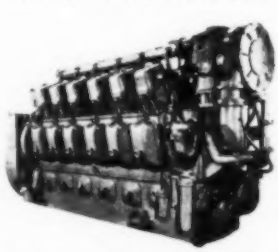


Three superb engine ranges are in production, covering between them Vee-form, in-line, and flat diesel design, making Paxman a major contributor to international rail transport

The 800-2300 b.h.p. 'VENTURA' is widely acknowledged as the greatest British advance in main line diesel progress for many years, combining a best-ever power/weight ratio with maximum accessibility and extreme compactness — features which make it the rail traction diesel of the immediate future



Also designed by Paxman specifically for rail traction applications is the exceptionally successful ZH 6-cylinder flat (only 30" high) diesel, with a power range of 300-450 b.h.p. Here is an engine of the well known 7" bore range which has Paxman's wide experience built into every inch — today's answer for mixed traffic locomotives, shunters and railcars



Largest of the trio . . . one of the world's most extensively used and highly developed rail traction diesels . . . the Alco 251 is built by Paxman as a 6-cylinder in-line, or as 12 and 16 Vee-form units, up to 3200 horsepower. It is backed by the wide experience of Alco Products Incorporated, U.S.A. one of the world's major locomotive manufacturers

Paxman rail-traction diesels range from 130 to 3200 b.h.p.

DAVEY, PAXMAN & CO. LTD., COLCHESTER, ENGLAND

A member of the RUSTON Group

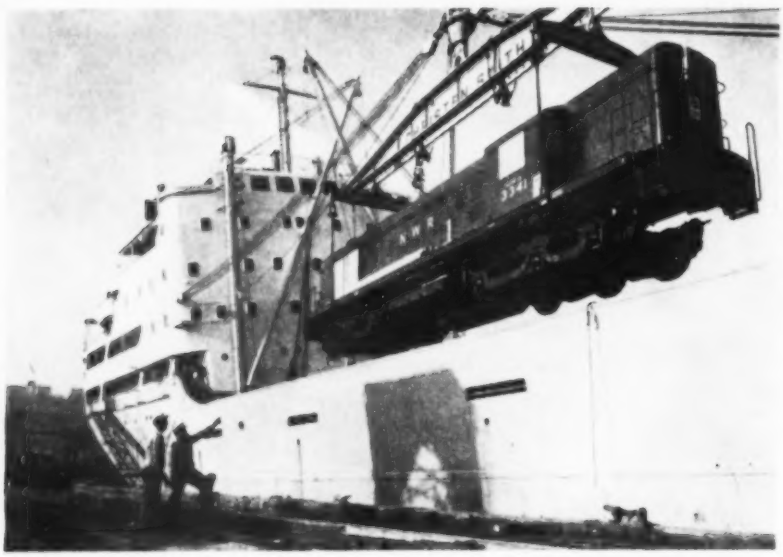
Cowans Sheldon 250 Ton Diesel Railroad Wrecking crane

There's BIG capacity for hard work in this Cowans, Sheldon 250 Ton Diesel-Hydraulic Wrecking Crane. This, the largest Railroad crane to come out of Great Britain, was completed in 9 months, and together with a smaller 150 ton version, is for the Quebec Cartier Mining Company. For reliable Cranes of all types, and for speedy delivery, consult Cowans Sheldon, the Crane Specialists.

DIESEL AND STEAM BREAKDOWN CRANES
HEAVY RAILWAY WORKSHOP EQUIPMENT
DOCKSIDE AND SHIPYARD CRANES

COWANS SHELDON

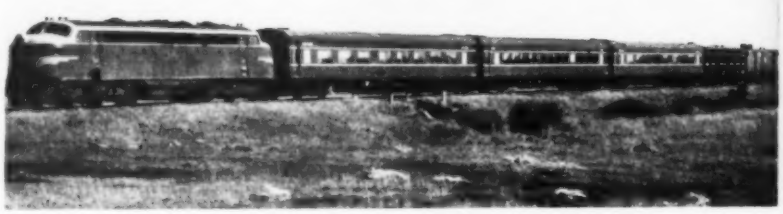
COWANS, SHELDON & CO. LTD.,
CARLISLE · ENGLAND
TELEPHONE: CARLISLE 24196 9
LONDON OFFICE: AFRICA HOUSE, KINGSWAY, W.C.2
TELEPHONE: HOLBORN 0268

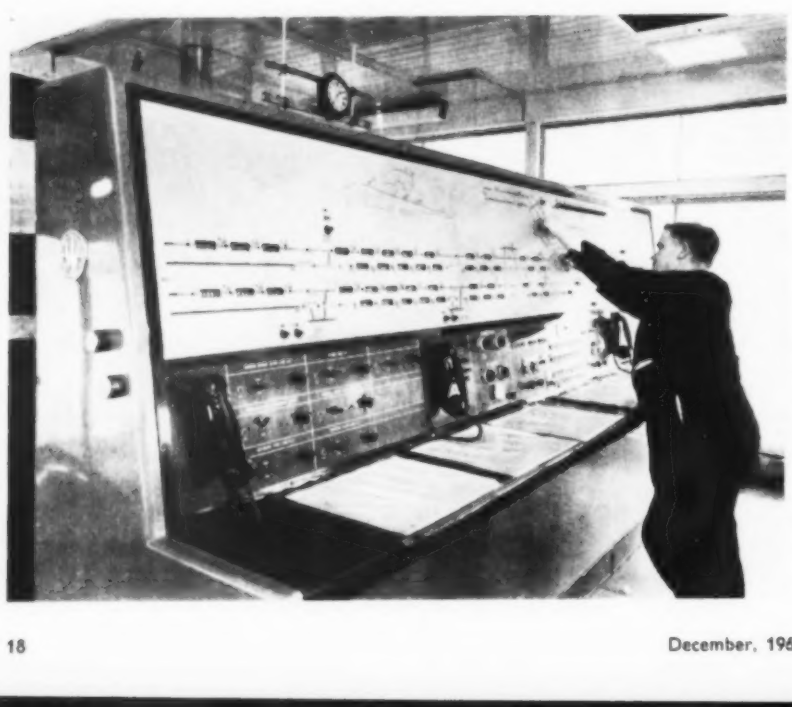


◀ PAKISTAN: The Norwegian ship, Belkarin, left the Port of New York recently with a shipment of new Alco diesel-electric locomotives for the North Western Railways of Pakistan. The locomotives were manufactured at the modernized assembly facilities of Alco Products, Inc., Schenectady, New York, USA. Designed for both passenger and freight service they are Alco's six-motor 1950/1800-hp Class DL-541 units, each of which is powered by a 12 cylinder, Alco Model 251 diesel engine. The 251 diesel has now been in service for more than six years and already proved itself on the hot, dusty plains of Pakistan. The 6650-ton Belkarin, of the Norwegian Belships line, has a heavy lift crane that enables it to load and unload its own cargo, such as the 110-ton locomotive shown in the accompanying illustration. The ship's destination was Karachi.

News briefs in pictures . . .

AUSTRALIA: In preparation for the ▶ new standard-gauge link with New South Wales, a Victorian Railways B class diesel-electric locomotive hauls 3 saloon type carriages with converted air-conditioning equipment. In N.S.W. the power for air-conditioning is supplied from a special generating van; in Victoria, power is generated under each carriage. As the power van system will be used for standard-gauge passenger trains, Victorian Railways has begun conversions.





◀ BRITAIN: Latest extension of color light signaling on the western lines of the LM Region of British Railways covers 24.1 km of quadruple track between Whitmore and Stafford. Included in the extension is a new power signal box at Norton Bridge Junction which replaces six mechanical boxes. This marks the completion of the first 160 km of line with full color light signaling and continuous track circuiting. The control panel in the new box is of the push button route setting pattern. It incorporates the track diagram on which signal, point, track circuit and route indication lights are displayed, together with a code number of each train in a small display panel at each signal. Points are electro-pneumatically operated and the entire equipment is designed to ensure reliable operation and immunity from interference from any possible AC traction effects.

JAPAN: Flexi-Van service is being used to transport high-pressure ethylene gas in Japan. This unit, built by Kisha Seizo Kaisha under a license arrangement with Fruehauf International, is being used by Maruzen Oil Co. to transport the gas between Kawasaki, near Tokyo on the main island of Honshu, to Mitsuhama, some 966 km south, on the island of Shikoku. K.S.K. first completed a Flexi-Van set for trial purposes last year, sold this one to Maruzen Oil this year. The system is found to operate within Japan's restricted loading gauge and clearance limits. The ethylene gas will be carried in 18 high pressure bombs measuring 232 mm in outer diameter and 6145 mm long as a group in communicating manifold.

◀ WEST GERMANY: Following eleven months intensive construction work, a double-track railway bridge across the Rhine river, near Coblence, was recently completed. Building costs amounted to a total of 4,000,000 DM. The bridge replaces a single-track construction, erected in 1947 as a temporary link between the left and right banks of the Rhine. Work began in October 1960 when the new framework was built alongside the old construction. The old bridge—weighing 1300 tons—was later moved two meters from its original position and the new framework—measuring 227 m long, 12 m wide and weighing 2000 tons—was slipped onto the new foundations. Work was co-ordinated during sliding operations by means of walkie-talkie wireless sets and loudspeaker system. After only six months the bridge was firmly positioned and a single track line taken into commission. Five months later, in September, the second track was completed.

BRITAIN: The North Eastern Region ▶ of British Railways is installing 586 point heaters at important junctions on the east coast main line to eliminate delays in winter due to frozen or snow-blocked points. The point heater consists of two similar assemblies, each consisting of a gas and air mixer unit connected to a 2.5-cm galvanized pipe. The mixer is normally fitted at the opposite end to the point toe and the assembly is fixed by coach screw clamps on the sleeper ends. Both mixers are coupled by 1.27-cm PVC piping from a common feed and carry propane under pressure. A shield over the mixer collects warm air from the first element to increase burning efficiency. Mixed gas ignites in front of a ceramic honey-comb block which, as it warms, moves the combustion area back into the block itself, providing a source of infra-red heat and forming a screen to prevent the gas from blowing out.

Coming: A New Transport Policy for the European Common Market

While the European Economic Commission has made considerable progress in integrating the economies of the "Inner Six," transportation has been neglected. But as the six nations of the Common Market move into a tighter-knit economic group, the impact will be increasingly felt by carriers in West Europe. Recognizing this, the European Economic Commission has now proposed a series of goals aimed at keeping transportation in step with the shifting European economy. These are being studied by the EEC Council of Ministers. The outcome is far from certain, but a study of the EEC proposals and talks with informed observers give some indication of what may be ahead for the railway systems of France, West Germany, Italy, Netherlands, Belgium and Luxembourg.

Taken as a whole the European Common Market has perhaps the greatest concentration of transportation facilities to be found. Transportation enterprises account for between 7% and 9% of the gross national product of the Inner Six. Investment in transportation ranges from 7.4% in Italy to 14.7% in West Germany.

The Common Market has well over 100,000 km of railways. The density of the CM's railway network is 11 km of track per 100 square km and 6.6 km per 10,000 inhabitants. This, of course, varies considerably, ranging from 5.5 km per 100 square km in Italy to 19.6 km in Belgium, and 2.9 km per 10,000 inhabitants in the Netherlands to 12.2 km in Luxembourg.

Together, the six major rail systems of the Common Market chalk up an average of 116 billion passenger/km and 127 billion freight ton/km a year.

Electrification varies considerably from country to country. About 12% of West Germany's network is electrified, while for the Netherlands the figure is well over 50%. These figures point clearly to the potential for expanding the capacity of the present Common Market rail system to meet any demands of increased production.

However, as in other parts of the world, competition from highway carriers and inland waterways is having its effect on railway transport. Inland waterways now account for about 25% of the total freight tonnage of the Six. Comparable figures for road transport are unavailable, but EEC estimates that highway freight tonnage increased 298% between 1950 and 1959 for the Common Market as a whole.

In West Germany, for example, the diversion of freight traffic from the rails has been quite severe. While total freight tonnage in the Bundesrepublik increased 77% between 1950 and 1960, the tonnage handled by the Deutsche Bundesbahn increased only 43%. During the same period, highway carriers and inland water carriers chalked up increases of 188% and 138% respectively.

During the past decade the DB's share of total freight traffic has dropped from 68.7% to 55.1%, while inland waterway traffic has climbed from 21.5% to 28.9% and motor tonnage from 9.8% to 16%.

"The motor carriers," says one DB official in terms that are frequently echoed by his US and British counterparts, "are picking the raisins out of the cake." The railways, he adds, are being left with a "monopoly on the bad risks."

Faced with this situation, the DB and other CM rail systems are eyeing the EEC closely in an effort to detect any policy recommendations that might enhance the competitive position of the waterways and motor carriers. The EEC, for its part, faced with maneuvering its transport recommendations past the divergent interests of six governments plus a multitude of private and state-owned transport systems is contenting itself at this stage with principles of a general—and often vague—nature.

The Treaty of Rome, which established the Common Market, and in which the procedures and mechanism for the free movement of goods are so meticulously laid down, is quite reticent about transportation. Unable to come to any agreement concerning transportation policy when the treaty was negotiated in 1957, the six nations passed on the job to the European Economic Commission.

In its preliminary memorandum on this subject, which was released earlier this year, the EEC has steered clear of definitive proposals—limiting itself to a number of principles which it hopes will serve as a guide to the development of a common transportation policy for the Six. Any such policy, says the EEC, should have two major objectives: (1) elimination of discrimination and (2) integration of transportation on the Community level.

Achievement of the first will prove one of the Commission's more difficult and—with nations such as Great Britain and Sweden applying for membership in the Common Market—more complex tasks. According to EEC, this first goal should include:

- Elimination of any form of discrimination in the rates and conditions of transport.
- Elimination, with due regard to the exceptions provided for under Article 80 (2) of the Rome Treaty, which deals with regional requirements and competition between modes of transport, of transportation rates and conditions involving an element of support and conferring artificial advantages on certain enterprises or industries.

• Adjustments of charges collected by carriers for crossing frontiers which are only justified when the carrier has to bear genuine expenditures.

• Application to transport of the Treaty rules relating to understandings, monopolies, and divergencies of a legislative and administrative nature likely to hinder the establishment of the Common Market as a whole.

In achieving its goal of integration, the EEC says the following steps are necessary:

• Establishment of common rules applicable to international transport.

• Establishment of conditions under which the carriers in one member state will have permanent access to all the transport facilities in another on the terms applied by the latter to its own nationals.

• Establishment of conditions permitting non-resident carriers to operate in any member state.

If adopted, these latter two points could mean a sharp increase in competition for the railways, since they would open the way for motor and waterway carriers, now somewhat restricted in international operations, to expand their operations.

Probably one of the most important sections of the EEC's memorandum is the five guiding principles it lays down as essential to the formulation of a common transportation policy. These are:

• Equality of treatment between carriers and shippers.

• Financial autonomy for the carriers.

• Freedom of action for carriers in fixing rates and in access to markets.

• Freedom of choice for shippers.

• Coordination of investment in the light of European economic integration.

The Commission makes no effort to set forth detailed procedures for carrying out these principles, but it is clear that adoption by the Six would greatly alter relationships in the transport sector.

Coordination of the various means of transport is not the only purpose which the EEC has in mind in attempting to work out a common transportation policy. Considerable thought is being given to transport as an economic-political tool in the Common Market's drive for better regional development, the establishment of a common agricultural policy and the concentration of various industries.

EEC officials put particular emphasis on the importance of avoiding a gap in the dynamic tempo of the Common Market's industrial growth due to failure to arrive at a workable transport policy. Consequently, carriers will be placed under considerable pressure to adapt as the internal tariffs (which have already been sliced 30% and are scheduled to be cut another 10% and possibly 20% 1 January) are eventually reduced to zero.

For many months detailed studies have been in progress in Brussels in an effort to develop a workable freight rate policy for the Common Market. No concrete recommendations on this subject are likely to emerge until well into 1962. But it is understood that the EEC is considering establishment of a system of "rate brackets", coupled with checks and a certain form of publicity. The "rate bracket" system would give carriers a certain amount of freedom in fixing rates within previously fixed minimum and maximum limits, which would curb excessive competition and prevent monopolies. Only limits of the brackets would be published in advance. Rates actually charged could be checked by means of forms introduced in 1960 by the EEC in Regulation 11.

The EEC believes that railways must be given sufficient freedom to enable them to take advantage of some of the more efficient administrative practices of private industry.

Measures of a detailed nature will be needed to give the EEC's proposed policy administrative teeth, and some of these are currently under preparation. These include measures dealing with the abolition of rate discrimination, establishment of uniform rules for international carriers, and the admission of non-resident carriers.

Consultations are planned to bring about some coordination of investments in the transportation field.

To implement some of the measures it is proposing, it will be necessary for the EEC to have access to adequate economic data. One of the first moves in this direction was taken recently when the Commission called on the Six to adopt uniform transportation nomenclature.

One of the first moves the EEC will make, if it can get the go ahead from the Council of Ministers on the basis of its general principles, is consultations with individual members of the Six aimed at bringing to a standstill all legislative activities in the field of transportation until the details of the final transportation policy can be agreed on. The measures finally adopted will have to come within the framework of a general program of action established in a specified timetable. Periodic reviews of policy, the EEC feels, should be held every two years, with more detailed studies at the end of the second phase of the Common Market's transitional period (the end of 1965) and at its close in 1969.

Thus far, the Common Market's most concrete steps in the transport field have come from the EEC's efforts to draw up a

Continued

Politique des transports de la Commission économique européenne

La Commission économique pour l'Europe a réalisé de grands progrès dans l'intégration de l'économie du Marché commun, mais elle a délaissé quelque peu le secteur des transports. Cependant, si les Six tendent à s'organiser toujours plus étroitement, cela aura des répercussions toujours plus fortes sur le régime des transports de l'Europe occidentale. La Commission économique pour l'Europe propose des mesures propres à adapter ce régime aux changements qui surviennent dans la vie économique européenne; le conseil des ministres de la Commission économique européenne est en train de les examiner.

Transportpolitik der Europäischen Wirtschaftsgemeinschaft (EWG)

Die Europäische Wirtschaftskommission erzielte mit der Integration des Wirtschaftswesens der EWG wesentliche Fortschritte, blieb aber auf dem Gebiete des Transportwesens zurück. Vereinigen sich jedoch die sechs Länder der EWG zu einer immer engeren Organisation, wird sich dies zunehmend auf die Verkehrsträger Westeuropas auswirken. Die EWG schlägt deshalb Massnahmen vor, um das Transportwesen mit den Veränderungen im europäischen Wirtschaftsleben im Schritte zu halten, was von ihrem Ministerrat gegenwärtig geprüft wird.

El Transporte en el Mercado Común

En tanto que las economías de los "Seis" continúan integrándose, no se ha hecho caso del transporte. Sin embargo, integrándose más y más las seis naciones del Mercado Común, los transportadores de Europa occidental estarán afectados en aumento por tal desarrollo. Teniéndolo en cuenta, la Comisión Económica Europea ha propuesto una serie de objetivos que permitirán al transporte adaptarse a los cambios de la economía europea. Serán estudiados por el Consejo de Ministros de la CEE.

Freight Transport in the Common Market

(in million ton/km)

	Rails	Motor carriers	Inland waterways
Germany	47,831	32,000	33,098
Belgium	6,118		4,813
France	53,400	25,900	9,450
Italy	14,328	35,608	
Netherlands	3,210	3,679	17,296
Luxembourg	595		

Source: United Nations—Bulletin Annuel de Statistiques de Transports Européens—1960.

Traffic Trends in Germany

Year	Total million tons	Deutsche Bundesbahn million tons	%	Inland waterways million tons	%	Intercity motor carriers million tons	%
1950	334.1	229.3	68.7	71.9	21.5	32.9	9.8
1957	522.5	303.3	58.1	142.3	27.2	76.9	14.7
1960	593.3	327.2	55.1	171.3	28.9	94.8	16.0

European Common Market Transport Policy continued

comprehensive infrastructure program. Originally drawn up in June, 1960, and revised a year later, one of its basic premises is that the networks of the Six countries currently consist of too many isolated units which have been built up with little or no thought to West Europe's overall needs and, in some cases, determined without consideration of economic factors.

Consequently, there are in some cases poor connections between major seaports and industrial centers; and lines of communications often focus upon capitals and certain industrial areas to the detriment of the requirements of a sound regional policy.

The network envisaged by the Commission would (1) form the main channels for the flow of both passengers and freight; (2) take into consideration requirements of regional policy; (3) serve the needs of major ports so that certain lines serve as extensions of maritime communications; (4) link industrial centers with supplies of raw materials and provide outlets for finished goods; (5) promote economic integration of the Community as a whole.

The Commission believes the most urgent need to be the establishment of major arteries in the Community through the coordination of existing national programs. It advises that "Government plans completed or under study could in certain cases be recast in the light of new needs." Future projects, it adds, will need to be synchronized in order to ensure the most rational exploitation of investments.

The Commission's present plans deal primarily with the establishment of major Community routes and not with the Common Market's less developed areas which are to be dealt with at a later date. Consequently, it is difficult for the Commission to obtain loans for this infrastructure program from the European Investment Bank (the EEC's financial organization), because early this year the Bank decided to give priority to projects directly aimed at improving conditions in the less developed areas.

The role of the Commission in the infrastructure program is strictly limited to coordination and planning of the projects which are in the last analysis the responsibility of the individual governments. Its overall program for rail, road, and inland waterways may be summerized as follows;

- For railroads: the inter-connection of the national electrified networks; the electrification of lines linking important seaports with the main industrial areas of the Community; and the increase of the capacity of certain lines by all other means available.
- For roads: establishment of main traffic arteries of a homogenious character ensuring closer links between the different countries.
- For inland waterways: the improvement of connections between seaports and their hinterland; establishment of links between the main river basins of the Six in order to make them accessible to inland waterway vessels of the European type.

The Commission's report carefully refrains from appraising the impact of this program upon the relative competitive relationship of the three transport sectors. However, other EEC sources indicate the detailed program—which it is envisaged will be completed by the end of 1969—favors roads and inland waterways over railroads.

Thus far, three of the dozen or more loans granted by the European Investment Bank since 1959 have gone to infrastructure programs. These were all granted in the course of this year for railway modernization projects in Italy, France, and Germany. An unusual feature of these loans is that the Bank's participation is proportionally much higher (up to 40%) than usual (15% to 18%).

Two loans totaling $25,000,000 are earmarked for the modernization and improvement of the line between Chambéry, France and Genoa, Italy. Four fifths of the money is intended to introduce a new system of electrification in northern Italy (from alternating to direct current).

The third loan (also for $25,000,000) is for the electrification of the major north-south German line between Hanau and Gemünden. This section has direct links with Austria, Switzerland, Italy, and the south of France and eventually will be connected to Hamburg and Bremerhaven in the north.

Other railway projects recommended by EEC are:

Belgium: Electrification of the lines running from the French frontier to Charleroi and Namur to Liége and the German frontier to make possible the introduction of electrified service between Paris and Namur by 1963, and Paris-Cologne by 1965. EEC also recommends the study of an electrified link between the Belgian and the Dutch networks through Visé and Maastricht.

France: Speeding up of the electrification of the lines from Creil, Aulnoye and Jeumont to the Belgian frontier, and from Aulnoye and Feignies to the Belgian frontier; continuation of the Paris-Châlons s/Marne-Révigny electrification; and electrification of the Strasbourg-Kehl and the Le Mans-Rennes lines.

Germany: The electrification of the Cologne-Aix-la-Chapelle-Belgian frontier route; the Wiesbaden-Cologne-Osterfeld-Sud Hamm-Dutch frontier line along the right bank of the Rhine; the Hamburg-Ludwigshafen line; and the Hamm-Hannover-Hanau route. Also recommended is the linking up of the German Federal and Dutch electric networks by electrification of the West German line from Cologne to the Dutch border via Kaldenkirchen, and from Oberhausen to the Dutch frontier via Emmerich.

Italy: Double-tracking of the section from Genoa to Modane and from Genoa to Ventimiglia.

Netherlands: Electrification of the line between Arnhem and the German frontier via Zevenaar and Venlo to tie in with the recommended German electrification project (see above).

TEEM Trains Slash Delivery Times

Faster and more reliable freight services, partly to meet truck competition, are the objectives of new TEEM (Trans-Europe Express Merchandise) trains now being operated on 30 routes serving 18 countries.

Modeling the operation on their successful TEE passenger services, 18 European railway systems have inaugurated joint international operation of fast new TEEM freight trains.

Purposes of the Trans-Europe Express Merchandise services are to provide shippers with faster and more reliable freight movements and, thus, to put the railways themselves in better position to meet highway competition.

The new trains have been in the planning stage since 1955. They were formally approved at a meeting of railway officers from participating countries at Budapest in November 1960, and began actual operation 28 May, 1961.

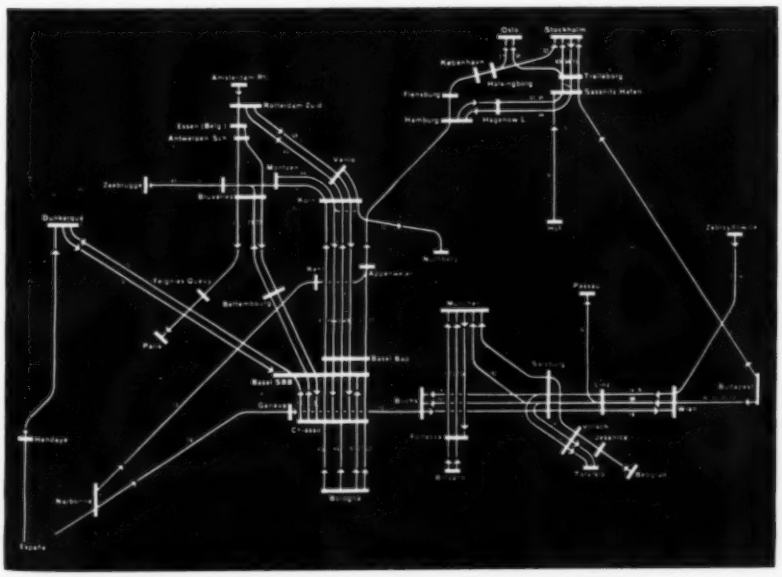
They already are producing substantial reductions in delivery times. A shipment from Narbonne, France, to Vienna, which formerly took 79 hours, can now be completed in 35. Freight from Bologna, Italy, to London can be moved in 44 hours, against 60 before inauguration of TEEM. Shipments from Great Britain and Belgium to Austria, Czechoslovakia and the Balkans, when carried on TEEM trains, arrive 10 hours earlier than before. TEEM freight from Italy to Oslo or Stockholm can be delivered 29 hours and 19 hours faster, respectively, than ordinary shipments.

The stepped-up service has been achieved by scheduling regular runs of high-speed trains, and by reducing time needed for border stops. TEEM trains must have a technical speed of from 55 to 65 mph (88 to 105 km/h); must maintain maximum permissible speeds en route; and must run through to scheduled terminals regardless of load. To insure on-time performance, they are limited in length to 100 axles and in weight to 1000 metric tons. Frontier stops, for customs formalities, must not exceed a maximum of two hours.

Despite the rigid schedule requirements and faster transit times, rates for TEEM service are only slightly higher (and in some cases actually less) than rates for ordinary freight. This is possible, at least in part, because conditions established for TEEM operation permit maximum utilization of motive power and rolling stock.

The trains are used principally for freight requiring fast delivery, with emphasis to date on perishable foods.

The existing TEEM network, shown on the accompanying chart, consists of 30 separate services, operated by the railways of Austria, Belgium, Czechoslovakia, Denmark, East Germany, France, Germany, Great Britain, Hungary, Italy, Luxembourg, The Netherlands, Norway, Poland, Spain, Sweden, Switzerland and Yugoslavia. It is expected that similar services eventually will be extended to all important consumer centers throughout Europe.



Trains-marchandises TEEM

Les nouveaux trains-marchandises TEEM (Trans-Europ-Express Marchandises), qui circulent sur les réseaux ferrés de dix-huit pays, sont essentiellement destinés, par un transport rapide et sûr des marchandises, à lutter contre la concurrence de la route. Comme les Trans-Europ-Express Voyageurs, sur lesquels ils ont été calqués, leur longueur et leur poids sont limités pour permettre un acheminement rapide, avec de brefs arrêts dans les gares frontières. Mis en service le 28 mai 1961, les TEEM réduisent sensiblement les délais de livraison des envois; les frais de transport sont à peine supérieurs et même, dans bien des cas, inférieurs à la normale.

TEEM-Güterzüge

Die neuen TEEM-Güterzüge (Trans-Europ-Express-Marchandise), an denen sich die Eisenbahnen von 18 Ländern beteiligen, sollen durch schnelleren und zuverlässigeren Gütertransport hauptsächlich der Strassenkonkurrenz entgegentreten. Nach dem Vorbild der erfolgreichen TEE-Personenzüge geschaffen, wird Länge und Gewicht der TEEM eingeschränkt, um rasche Beförderung mit kurzen Aufenthaltszeiten auf Grenzstationen zu erzielen. Die am 28. Mai 1961 in Betrieb gesetzten TEEM-Züge ermöglichten wesentlich kürzere Lieferfristen mit nur wenig höheren, in manchen Fällen sogar niedrigeren Frachtkosten.

Trenes TEEM

Servicios de carga más rápidos y de mayor seguridad, los que puedan afrontar la competencia de la carretera, he aquí los objetivos de los nuevos trenes TEEM (Trans-Europ Express Marchandise), los que se operan por los ferrocarriles de 18 países. A imitación de los servicios de pasajeros TEE, los nuevos trenes de carga son de largura y de peso limitados para mantener los horarios de alta velocidad y las breves paradas en las fronteras. Comenzó su operacion en mayo 1961 y produce una reducción considerable del tiempo de entrega a precios algo mayores y en algunos casos hasta más bajos.

Werkspoor Builds New Trainset for NS

The Netherlands Railways last month put into service a prototype electric four-car trainset which, according to the manufacturer—Werkspoor, N.V.—is the lightest in its class. Designed for fast, short-distance services, the trainset has an empty service weight of 163 tons, buffing strength of 200 tons, and an acceleration rate of 120 km/h within 100 seconds.

The fundamental layout of the new train—designated NS 501—differs considerably from the four-car sets constructed by Werkspoor in 1956. The latter consist of two end coaches containing the electrical equipment and mounted on motor bogies, while the intermediate coaches are trailers. In the new prototype trainset, the electrical equipment is installed in dust-proof and water-tight central units under the floor of the intermediate coaches. The traction motors, eight of 140 kw, are mounted on bogies under the intermediate coaches, with the driving trailers resting on trailer bogies. Two pantographs of the Faively-type are mounted on one of the intermediate coaches, which also contains a circuit breaker.

The total length of the train is 100 meters. The distance between bogie centers is 18,350 mm and the wheelbase is 2750 mm.

The train has a total seating capacity of 281: 41 first class, and 240 second class. Maximum service speed is 140 km/h, and a top speed of 175 km/h has been reached during trials.

To meet the Netherlands Railways' specifications for a trainset with a maximum service weight of 170 tons, Werkspoor was faced with the job of trimming 43 tons off the weight of four-car trainsets now in service on the NS. Through use of mixed steel construction, a new bogie design, and a careful study of all components, Werkspoor has produced a trainset with an empty service weight of 163 tons. Meterweight (length to weight) of the train is 1630 kg/m (or 350 kg/m for the naked car bodies), and seat weight has been reduced from 900 kg to 585 kg—making the trainset, Werkspoor claims, the lightest in the world for its class. Interior fittings such as luggage racks, window frames, ash trays and hand grips have been constructed of light metals, while polyester has been used for the front skirt, inside window frames, outside door, and driver's table.

The coaches are designed for a buffing force of 200 tons, while the streamlined ends are designed for 200 tons at sole bar level, and for 75 tons at 70 cm above this level.

The all-steel car body is of a completely welded construction, whereby underframe, roof and side walls form an integral load bearing structure. Werkspoor used this construction for the first time in 1923 for riveted coaches, and again in 1932 for the first completely welded coaches.

The body-frame is built up of suitable pressed steel sections, while the underframe consists of two solebars in Z-pressed steel sections and a number of crossbars in [-section.

The roof consists of a pressed section for the cantrails and roofsticks, while the sheeting of 1.5 mm is provided with corrugations, thus avoiding the application of scantlings. The sheeting for the side walls is 2 mm thick. This construction principle was also used for the couchette coaches and diesel-electric three-car trainsets, which Werkspoor has delivered during the last few years.

To reduce weight of the trainsets, Werkspoor chose a mixed construction, viz. steel with a tensile strength of 52 kg/mm² for the complete underframe and steel with a tensile strength of 37 kg/mm² for the superstructure and sheeting. The steel employed is S.M. steel of good welding quality. The weight reduction for the naked car bodies in comparison with former electric trainsets is 22 tons, or nearly 40%.

Bogies account for 30% of the total train weight of previous electric trainsets manufactured by Werkspoor. To achieve the same riding quality and at the same time reduce weight, the manufacturer adopted a new bogie design it is using for its diesel-electric three-car trainsets, but reduced the wheel base of the motor bogies from 3000 to 2750 mm. In improving the rollstability, the springbase of the secondary springing is increased. The secondary springing consists of a coil-elliptic spring system. For the primary springing, two springs are arranged at both sides of the axle-box, resting on a compensating beam which is connected to the underside of the axle-box.

Rotation braking is applied by using a large center-pivot, which is provided with a dry friction plate. The guiding of the bolster takes place by means of traction links, which are provided at both ends with Metalastik blocs. The side movements of the bolster are controlled through the application of hydraulic shock absorbers. The wheels on the new trainset are designed for at least 260,000 km without returning.

The coach head is designed in such a way that in case of accident it affords the greatest possible protection for the driver. The design is based upon the consideration that, on the one hand, the nose should be strong enough to reduce damage in minor collisions to a minimum and that, on the other hand, it should not be so strong that in a heavy collision it would remain intact, causing the damage to occur in the part behind the nose.

A careful study has been made to determine the correct slope of the windscreen in connection with snow and rain; the design is such that it offers least possible air resistance. Moreover, it was essential to avoid an unnecessarily com-

Continued

Prototype de rame automotrice pour les Chemins de fer néerlandais

Les Chemins de fer néerlandais ont mis en service, la semaine dernière, un prototype de rame automotrice électrique à quatre éléments, construit par les usines "Werkspoor N.V.". Cette rame, d'un poids en service de 163 t, pèse 20% de moins que les compositions du même type sorties de "Werkspoor" pour le même réseau. Elle a une longueur de cent mètres, un poids de 1630 kg au mètre, ou de 585 kg par place assise, étant ainsi l'unité la plus légère de sa classe. Son extraordinaire force de démarrage et d'accélération atteint 120 km/h dans les cent premières secondes. L'équipement électrique est centralisé sous le plancher des voitures intermédiaires et les huit moteurs de traction de 140 kW sont logés dans les bogies correspondants. Une voiture intermédiaire a deux pantographes du type "Faively", qui conduisent le courant continu de 1500 volts aux moteurs suspendus par le nez, qui développent chacun une puissance de 200 CV et actionnent la transmission élastique. Les caisses des voitures, entièrement en acier, sont autoportantes. Le train offre 281 places assises, dont 41 de première classe et 240 de seconde. Les Chemins de fer néerlandais envisagent de commander encore dix rames de ce type.

Prototyp-Triebwagenzug der Niederländischen Eisenbahnen (NS)

Die NS haben letzte Woche einen elektrischen Prototyp-Triebwagenzug, der aus vier Wagen besteht und von der Werkspoor N.V. gebaut wurde, dem Betrieb übergeben. Dieser Zug, der ein Dienstgewicht von 163 t aufweist, wiegt 20% weniger als die früheren von der Werkspoor für die NS erstellten Kompositionen gleicher Art. Er hat eine Länge von 100 m, ein Gewicht von 1630 kg pro m, oder von 585 kg pro Sitzplatz, und ist somit die leichteste Einheit seiner Klasse. Sein ausserordentliches Anfahr- und Beschleunigungsvermögen erreicht 120 km/h innerhalb der ersten 100 Sek. Die zentralisierten elektrischen Ausrüstungen sind unter dem Bodem der Zwischenwagen und die acht Triebmotoren von 140 kw in den entsprechenden Drehgestellen untergebracht. Ein Zwischenwagen besitzt zwei Faively-Typ-Stromabnehmer, über die den Tatzlagermotoren, die je 200 PS entwickeln und den Federantrieb betätigen, Gleichstrom von 1500 Volt zugeführt wird. Die Ganzstahl-Wagenkasten sind selbsttragender Art. Der ganze Zug verfügt über 281 Sitzplätze, wovon 41 erster und 240 zweiter Klasse. Die NS beabsichtigt, 10 weitere Triebwagenzüge dieser Art in Auftrag zu geben.

Rama prototipo para los ferrocarriles holandeses

El mes pasado los ferrocarriles holandeses pusieron en servicio el prototipo de una rama eléctrica de 4 coches construída por Werkspoor N.V. Siendo el peso en vacío 163 toneladas la rama pesa 20% menos que las ramas anteriores construídas por Werkspoor. El tren tiene una longitud de 100 metros y pesa sólo 1630 kg. por metro, el peso por asiento es de 585 kg. Tiene una fuerza aceleratriz extraordinaria; 120 km por hora dentro de los 100 primeros segundos. Se ha instalado el equipo eléctrico en los coches intermedios en unidades centrales bajo el piso. Los 8 motores de tracción de 140 kV se encuentran en los bogies motor. Uno de los coches intermedios tiene dos pantógrafos del tipo Faively. La corriente contínua de 1500 V alimenta por el pantógrafo los motores suspendidos por la nariz, cada uno de 200 HP. El mecanismo de transmisión tiene un engranaje elástico. La caja de acero es de diseño tubular. La capacidad del tren es de 281 asientos: 41 de primera y 240 de segunda clase. Los ferrocarriles holandeses adquirirán diez de estas ramas.

"Turn-swing" exterior entrance doors are operated electro-pneumatically

The control panel has been designed for high operating efficiency. Entire coach head has been built to give greatest possible protection to the driver

Werkspoor cont.

plicated design in view of reinforcement, which had to be provided inside the sheeting, and certain esthetic requirements had to be fulfilled. A number of models were tested at the National Aeronautics Laboratory at Amsterdam. All this resulted in a coach head construction with the best possible head and tail resistance within the limits set by the requirements mentioned above.

As a further measure to reduce weight, the sound and heat insulation consists of a layer of anti-drone material with fibreglass for roof, side and front walls. The underside of the corrugated flooring is also sprayed with a sound-absorbing material. An extra plate is fitted under the floor above the bogies and the space thus formed is sprayed with material which affords better sound insulation at the point of the noise source. The weight of the total amount of insulation is 7.5 tons for the trainset.

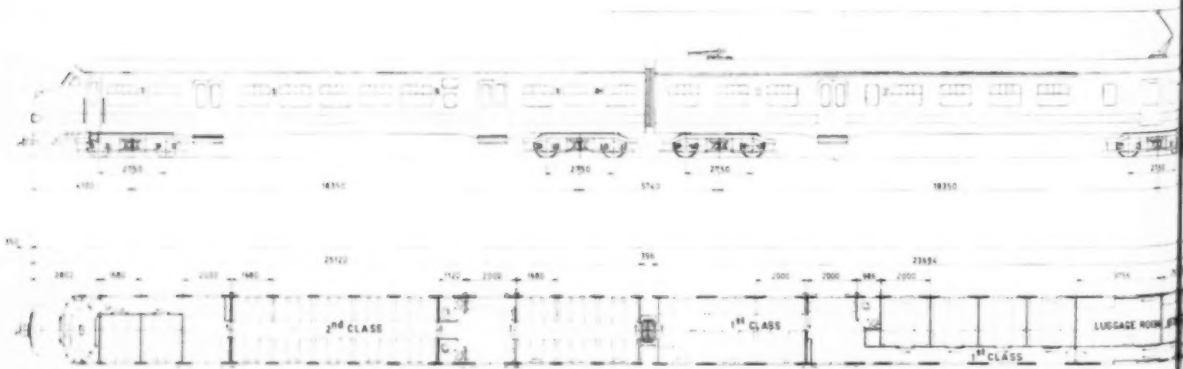
Careful attention was given to the suspension of rotary machines, such as generators and compressors.

The interior of the coaches has been decorated with suitable color combinations and panels of simple design. The interior finishing consists of plasticboard for side walls and partitions. The windows in the passenger saloons are of the so-called Hurricane type, whereby the lower part is fixed and composed of double panes. This construction has favorable thermal and acoustic qualities and ensures an unobstructed view for riders.

The complete window-set is mounted in the side wall by means of a rubber profile. The inner framing is made of polyester. The seats are made of a framing partly of stainless steel, and the seats are upholstered with foam rubber. In first class they are covered with plush and in the second class with artificial leather.

The coaches are lighted by fluorescent tubes, which are mounted in two rows on either side of a symmetric lowered section in the center of the roof, thus giving an equal distribution of light.

The exterior entrance doors, operated electro-pneumatically, are of a new design. The doors, made of polyester in a light-metal framing, are of the "turn-swing" type. This type has the advantage



The Werkspoor-built NS 501 has a total seating capacity of 281; 41 first class and 240 second class. Empty service weigh 163 tons

By adopting a new bogie design Werkspoor made important weight reductions in the final trainset and still achieved satisfactory riding qualities

Seats are partly framed in stainless steel and upholstered in foam rubber

over sliding doors in that the scaling is simple, because the doors are flush with the side wall. The inside doors are made in extruded steel sections, thus giving a wide view for the passengers.

The heating is effected by warm air. The fresh ventilating air is drawn in by a motor-driven fan through grilles in the roof and then via filters and the heater, housed in the roof. Thence it is blown through ducts in the ceiling of the passenger saloons.

The ducts and outlets for the air are dimensioned in such a way that 60% of the air quantity flows via the openings in the ceilings and 40% through ducts which have their outlets under the seats.

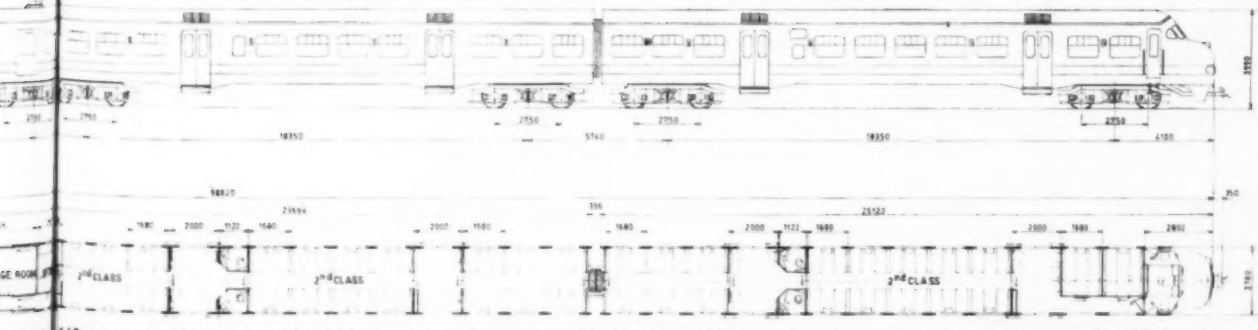
The air flows through grilles in the compartment doors to the platform and is blown to the outside or drawn by the ventilator via recirculation apertures in the ceiling of the platform.

All operations are automatic and are controlled by the temperature in the passenger saloons. Even the quantity of recirculation air is automatically controlled by thermostats. In warm weather, the fan is used to provide forced ventilation without heating.

DC current of 1500 volts is fed via the pantograph to the nose-suspended traction motors with a rating of 200 hp each. Drive is by means of single transmission with resilient gearwheels. The installation is protected by a rapid circuit-breaker. This cut-out is installed in a cabinet in the luggage room. Cables for the electrical equipment are housed in the floor corrugations without piping. The piping in the ceiling is carried out with polyvolt plastic pipes, which give an important weight reduction. The electrical apparatus is generally housed in large boxes, thus reducing cable-lengths and cutting maintenance costs.

All passenger compartments and platforms in the train are fitted with loudspeakers for communication with passengers.

Main contractor for the electrical traction equipment was N.V. Electro-technische Industrie v/h Willem Smit & Co., Slikkerveer, Netherlands. Subcontractors were Heemaf, N.V., Hengelo, Netherlands; AEI, England; and Philips N.V., (lighting equipment and intercom equipment) of Eindhoven, Netherlands.



weigh 163 tons; buffing strength, 200 tons; acceleration: 120 km/h in 100 sec.; and maximum service speed, 140 km/h

SAR Mechanizes Track Maintenance

The manually wielded "beater-pick," which has for more than a hundred years been the standard tool for consolidating track ballast on the South African Railways' permanent way, is fast being replaced by power tools which are being introduced on a considerable scale in a program of mechanization of track maintenance.

On-track machine cleans and distributes ballast on South African Railways

The ballast tamper has become a familiar sight on South African Railways' permanent way, but its tamping function has been extended by a device which enables the machine to raise and cross-level the track at the same time. The device makes use of two horizontal wires fixed to a chosen "high point", up to 182 meters ahead of the machine. The wires are highly tensioned by means of hydraulic motors which maintain the tension as the machine works forward to the high point. An ingenious jacking mechanism attached to the front of the tamper raises the track until a contact touches the wire, which automatically stops the lifting operation independently for each rail, thereby achieving the lifting and cross-leveling of the track. Tamping proceeds to compact the ballast until the preset density is obtained. By adjusting the cut-out contacts, transition and curve-super-elevations can be applied exactly.

Ploughing and scarifying of the ballast bed is a well known procedure on the South African Railways, but requires a big labor force to clean and replace the ballast. The use of the plough and scarifier places the ballast at the outside edge of the sleeper zone where it can be cleaned. This cleaning operation has hitherto been performed by hand by means of ballast forks which results in leaving the finest behind. Here again mechanization is taking over in the form of a ballast distributor and cleaner.

The ballast distributor is a large on-track machine which, by means of an endless bucket chain, picks up the windrows of ballast at the track edge, puts it through a vibrating screen and returns it to the track on each side of the rail in the best position for the subsequent compaction by heavy tampers. The machine will also distribute new ballast which has been dumped along the track from railway trucks, and is proving especially useful in areas where rail traffic is most intense.

For many years it was contended that the use of center- and side-discharge ballast wagons was not a practicality on a 1.067-m gauge railway.

Recently an experimental batch of 12 such wagons were built in South Africa for use on track maintenance work and the experiment was so successful that a further 100 wagons have been ordered.

The old method of dumping ballast alongside the track meant that most of the stone had to be moved manually and placed evenly in the sleeper zone. The use of center- and side-discharge wagons permits the placing of ballast between the rails as well as along the sleeper edge, thus facilitating leveling and tamping.

The introduction of concrete sleepers brought in its wake the complication of achieving a consistent tightness of the elastic fastenings connecting the sleeper to the rail.

As a result of extensive experiments, a hydraulically-operated, coach-screwing machine has been developed during the past two years. This machine, due to the speed with which it tightens the fixing nuts to the cast-in bolts in concrete sleepers, solves the difficulties experienced where the problem of correct tension on sections laid with long-welded rails is complicated by the de-stressing which requires that all fastenings in each .8046-km length must be secured within a period of one hour. Twenty of these machines are now in use.

Radio control of tampers is another recent innovation. Experiments have been carried out with radio transmitters and receivers mounted in heavy tampers and at stations on either side of the section being worked to reduce delays to trains and tampers which would arise from the normal trains working methods. These experiments were successful and four complete outfits have been ordered.

Mécanisation en Afrique du Sud

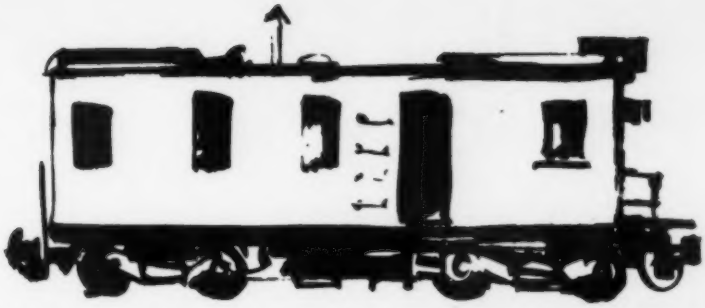
Les Chemins de fer sud-africains suivent le progrès en multipliant leurs appareils techniques. Le bourrage des traverses à la pioche, qui fut en honneur durant plus de cent ans dans l'entretien de la voie, cède de plus en plus la place à la mécanisation. Le nouveau programme d'entretien de la voie prévoit l'achat d'un grand nombre de machines.

Mechanisierung in Südafrika

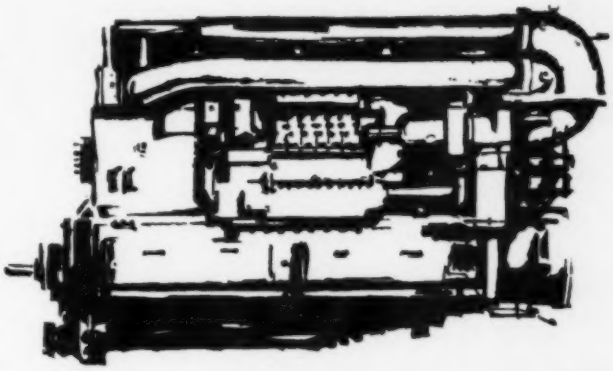
Die Südafrikanischen Eisenbahnen halten Schritt mit der Entwicklung durch eine weitgehende Vermehrung ihrer technischen Hilfsmittel. Das Handstopfen mit der Kramphaue, das mehr als 100 Jahre dem Bahnunterhalt diente, wird zunehmend durch die mechanische Krampung abgelöst, und das neue Bahnunterhaltsprogramm sieht die Anschaffung einer merklichen Anzahl entsprechender Maschinen vor.

Mecanización en el África del Sur

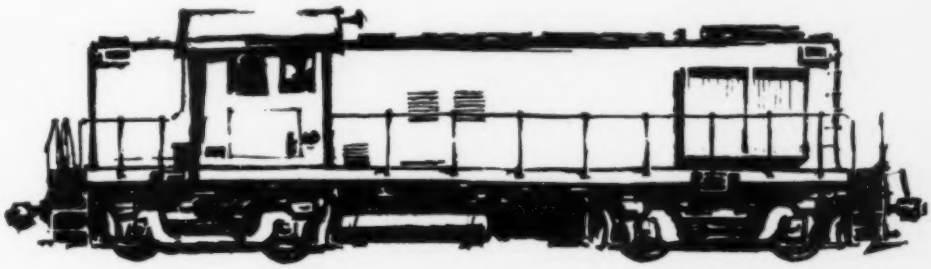
Los Ferrocarriles Surafricanos disfrutan del progreso aumentando su parque de equipos mecanizados. El bate que por más de cien anos era el útil standard para apisonar el balasto en la superestructura de los FC surafricanos, se está sustituyendo más y más por herramientas mecánicas que figuran en gran escala en un programa de mecanización de la conservación de vía.



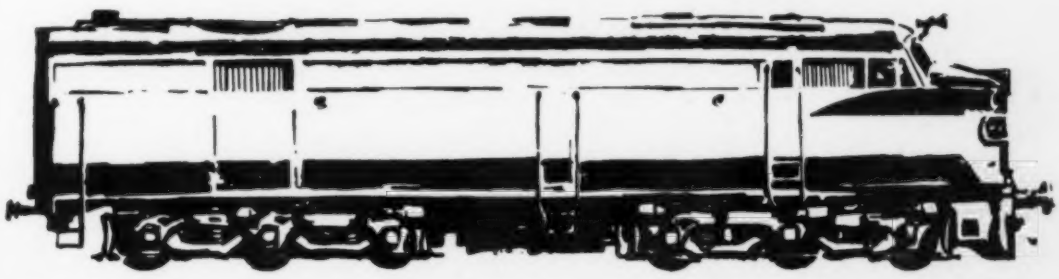
The company that built the first commercially successful diesel electric



The first turbocharged railway diesel engine



The first all-purpose type locomotive



The first standard streamlined locomotive for restricted clearances

NOW BRINGS YOU...

A new series of high-horsepower, single-engine locomotives for world-wide conditions

Continuing advances in ALCO's development of turbocharged diesel engines with high mean effective pressures has made possible a new series of locomotives suited to world-wide conditions. They include DL-535, 1350/1200 hp, extremely reduced clearances, 11.25 metric tons per axle; DL-543, 2150/2000 hp, restricted clearances, 16 metric tons per axle; and DL-560, 2600/2400 hp, for very heavy-duty service. In addition, nine other standard ALCO locomotives, from 975 to 2600 bhp, with high and low axle loads, are available.

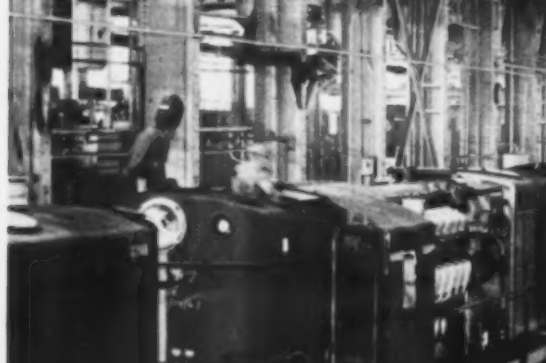
ALCO **PRODUCT QUALITY COMES FIRST**

This past year...
railways on 5 continents again chose ALCO locomotives

The efficiency and high quality of ALCO locomotives has led to their choice in the past year by railways in Europe, Asia, North America, South America and Australia. Excluding those in Canada and the U. S., there are now more than 2 million ALCO horsepower in service around the world. ALCO offers more locomotive models, in a wider range of horsepower rating, than ever before.

Photo taken August 15, 1961

ALCO locomotives are assembled in this plant in Schenectady, New York—the most modern locomotive plant in the world.



ALCO's Australian Licensee A. E. Goodwin Ltd. is producing a sizeable order of DL-531 locomotives for the New South Wales Government Railways.

For more information, write: **ALCO PRODUCTS, INC.**, 530 FIFTH AVE., NEW YORK 36, N.Y., U. S. A. (CABLE ADDRESS: LOCOMOTIVE, N.Y.) or contact any of the following foreign associates and licensees: **ALCO PRODUCTS EXPORT CO., INC.**, 8 GRAFTON ST., LONDON; **MONTREAL LOCOMOTIVE WORKS, LTD.**, BOX 1000, PLACE D'ARMES, MONTREAL; **ASSOCIATED ELECTRICAL INDUSTRIES**, TRAFFORD PARK, MANCHESTER, ENGLAND; **A. E. GOODWIN LTD.**, 315 PARRAMATTA RD., AUBURN, N. S. W., AUSTRALIA; **DAVEY, PAXMAN & CO., LTD.**, COLCHESTER, ENGLAND; **CIA EUSKALDUNA**, CASTELLANA 1, MADRID. Agents throughout the world.

ALCO **ALCO PRODUCTS, INC.** *Product quality comes first*

Australia Builds New Line

Work is underway on a $75,000,000 rail link between Mount Isa in the Queensland outback and the coast at Townsville, some 965 km away. This reconstruction of the existing line, which was built more than 50 years ago, is now urgently needed to allow Australia's great north-east mining center to go ahead with its vast expansion program. The project will have a far-reaching effect on mineral development in this area when it is completed within the next five years. The Australian Federal Government is providing two-thirds of the cost of the new railway, the balance coming from Queensland itself.

This modern rail link for heavy freight will provide a fast and economic transport system channeling into world markets huge quantities of silver, lead, copper, zinc and uranium ores from the neighboring mines of Mount Isa and Mary Kathleen, whose companies have established themselves as highly profitable ventures with investment totaling nearly $100,000,000. It will also vastly improve communications with the big new copper refinery at Townsville.

The existing track, much of it of 19-kg rail, is being replaced with 37.1-kg rail. On the new tracks, modern diesel-electric locomotives traveling at 81 km/h with loads of 2600 to 3500 tons of ore will take over from the present inadequate service of only 600-ton capacity at top speeds of 48 km/h.

The real business of track-laying got under way earlier this year with the arrival of Mr. Lou Franco, president of Franco Railroad Contractors Inc., one of the partners in the syndicate contracting group headed by the Australian firm of M. R. Hornibrook Pty. Ltd., of Brisbane. Modern track-laying equipment worth about $1,000,000 is being used to put down the heavy duty rails in 36.4-m welded lengths as opposed to the usual 12.2-m length. The gauge is 1.067 m, standard throughout Queensland.

The new track is laid on crushed stone ballast placed on top of the existing and new earth formation. To keep the line open while reconstruction is in progress, the new rails are first laid on the old sleepers. Later, a special sled-type piece of heavy equipment is winched along under the track to plough out old ballast and the old sleepers are removed and replaced with new ones.

The new rails are moving westward from the Richmond construction headquarters, 476 km from Mount Isa, at the rate of about .8 km a day. This link will be completed during 1962, when work will start under separate contract on 160.9 km of the line between Richmond and the coast, 494 km to the east. The line has already been reconstructed for 72.4 km west of Richmond.

The actual track construction is being done in separate stages. An unbolting machine, motor driven, unbolts the links between the old rails while a power-driven machine removes spikes. The rails on one side are removed and an adzing machine, driven along the remaining rail, cuts the sleepers to uniform level. New rail is then placed on the adzed sleepers and bolted together by power equipment. After the rail is gauged from the opposite old rail a machine drills the required holes in sleepers to receive the track spikes. The spikes are started by hand and fully driven with pneumatic tools; the opposite old rail is then removed.

A bulldozer with a 4.5-m obstacle-removing blade clears all stones and rubble from either side of the track, and then winches the patent Stein sled along under the rails. The sled cleans out and grades the road bed, old sleepers needing replacement are removed and new sleepers placed in position. The boring machine and spike driver move in again to attach the new rails to the new sleepers, and ballast is dropped through hoppers from a ballast train between and around the sleepers. A light power jack tamper then raises the rails and tamps ballast under sufficient sleepers to support the production tamper. A larger Swiss-made production tamper follows, tamping ballast under all sleepers, and in the final stage a ballast regulating machine sweeps up and trims the shoulders.

Not only will the new rail link with Townsville play a key part in the expansion of the Mount Isa-Mary Kathleen mine concentration, but it will serve future mineral discoveries in the interior of Queensland and benefit the beef cattle raisers of the outback. Already Mount Isa Mines is the largest individual earner of overseas income for Australia. If the prediction of Queensland's Premier, Mr. Franklin Nicklin, is correct, Mount Isa Mines Ltd. and its subsidiaries will have a potential export income of about $150,000,000 a year by 1964—double the amount being spent on the Mount Isa to Townsville rail link.

New rail link will help speed freight from Mt. Isa and Mary Kathleen mines

Aménagement de ligne en Australie

Des travaux d'aménagement, budgétés à 75 millions de dollars, sont en cours sur la ligne reliant Mount Isa, dans l'intérieur du Queensland, à Townsville, sise sur la Côte, à 965 km de distance. Ils seront achevés dans cinq ans, après quoi la ligne, construite il y a cinquante ans, contribuera grandement à développer le grand centre minier du nord de l'Australie.

Australiens Eisenbahn-Bindeglied

Auf $75,000,000 budgetierte Arbeiten an der Bahnverbindung zwischen Mount Isa im Innern Queensland und dem 965 km entfernten Townsville an der Küste haben begonnen. Der Ausbau dieser seit 50 Jahren bestehenden Linie wird, nach ihrer in 5 Jahren zu erwartenden Vollendung, die Entwicklung des grossen Bergbauzentrums im Norden Australiens wesentlich beeinflussen.

Enlace Ferroviario en Australia

Se está construyendo un enlace que costará $75.000.000, entre Mount Isa en Queensland y la costa cerca de Townsville, una distancia de unos 965 km. Esta reconstrucción de una línea ya existente construída hace 50 años producirá un efecto de gran alcance en el desarrollo mineral de la industria minera del noreste de Australia.

(1) Passenger terminal (restaurant, hotel, shops); (2) luggage and express parcels hall; (3) service building; (4) Signal-box II; (5) shopping center; (6) garage; (7) station for postal coaches; (8) PTT offices; (9) post offices; (10) postal station

CFF Builds New Berne Station

By R. Desponds
Head of the Office for the Reconstruction of Berne Station
Swiss Federal Railways

The Swiss Federal Railways is now constructing at Berne what will be one of the world's most modern passenger terminals and municiple centers. Started in 1957, construction of the terminal is scheduled to be completed in 1968. Total cost is estimated at 200 million francs. The article below is an up-to-date progress report on this important construction project.

Berne's first passenger terminal was erected on the same site as the present one in 1860—three years after completion of the Zürich-Berne line of the then Swiss Central Railway. Originally a dead-end station, it was transformed for through working in 1889-91, and enlarged in 1902. A new locomotive depot was built in 1911, and a new goods station in 1930. A large viaduct, taking four tracks over the river Aare, which was constructed between 1937 and 1941, considerably improved the northern approaches to the station. The main buildings and layout, however, have remained the same since 1902. Since that time the population of Berne has doubled—to 200,000—and the terminal is no longer adequate for current needs.

Situated on the Zürich-Geneva and Basle-Lötschberg-Simplon trunk lines, with a branch to Interlaken and beyond, and as the originating point of private lines to Neuchâtel, Schwarzenburg, Thun, Solothurn and Worb, the Berne terminal is the Swiss Federal's third most important—following only Basle and Zürich. It receives and dispatches 650 trains and handles 3000 shunting movements per day. An average of 50,000 passengers use the station daily—a number which easily increases to 75,000 on peak days.

Planning of the new Berne station predated the beginning of actual construction by a good many years. Following the final decision to build the new terminal on the same site as the present station, planners had then to coordinate the objectives of four different groups:

- The Swiss Federal Railways: Doubling the operating capacity of the station and overall improvement of passenger facilities.
- Swiss Postal Administration, which handles the heaviest traffic per capita of any country in Europe: Construction of a Swiss Central Post Office, a postal cheque office, a mail and parcels office and a large hall as a central station for the Swiss Postal Coach Services—the last

two buildings to be located directly above the platform tracks.

• The Canton of Berne, which more or less controls five private railways leading into Berne: Construction of a subterranean station below the platform tracks for the meter-gauge railways Solothurn-Berne and Worb-Berne. This project, incidentally, will have the effect of centering practically all Bernese urban transportation lines on the main station area.

• The City of Berne—adaptation of the surroundings of the main-station area to modern traffic requirements and, in particular, the construction of a garage for 500 autos plus a shopping center, both covering a surface of about 2.47 acres.

Coordination of all construction projects connected with the new terminal, which will cover ten acres and will be built in several tiers, has been turned over to the Swiss Federal Railways. Thanks to the judicious use being made of steel and of re-inforced concrete as well as prestressed concrete, it is possible to take advantage of air space as well as the space below the normal platform lines, thus creating something like Switzerland's first underground station.

Total cost of the project, which is scheduled for completion in 1968, will come close to 200 million francs—half of this for railway installations, one quarter for postal buildings, and the remainder for the public garage, shopping center and the rebuilding and adaptation of surrounding highways.

The railway construction end of the project must meet a variety of unequal traffic requirements in handling five lines of the Swiss Federal Railways of varying capacity and five lines of private railways with a relatively moderate volume of traffic. Two of the latter, both meter-gauge, are being routed into a separate underground station below the main station sidings.

The capacity of the present station is 18 trains every half hour. This will be increased to 35 when the new terminal is completed. This increase of 90% in capacity is being achieved by:

• Construction of a double-trackline leading to the goods station and of two new tracks giving the private lines from Neuchâtel, Schwarzenburg and Belp-Thun an entirely separate access to the station.

• Transformation of the storage sidings in such a manner that by means of new crossings, etc., different trains can circulate, or shunting movements take place, at the same time.

• Providing six large platforms of a length (300 to 340 m) to accommodate

Continued

La nouvelle gare de Berne

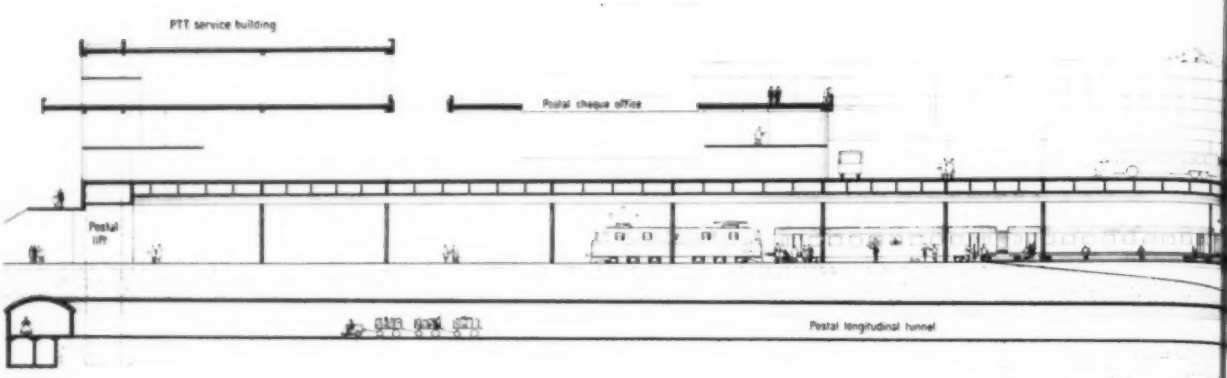
La nouvelle gare de Berne, que construisent actuellement les Chemins de fer fédéraux suisses, sera l'une des installations ferroviaires les plus modernes du monde en même temps qu'un centre urbain modèle. Les travaux ont commencé, dans l'enceinte de la gare actuelle, en 1957; ils seront achevés en 1968. Le devis prévoit une dépense totale de 200 millions de francs. Noeud ferroviaire d'où partent directement ou indirectement, dans le sens des aiguilles de la montre, les lignes principales et secondaires d'Olten (Bâle, Zurich), de Lucerne, de Thoune (Interlaken, Lötschberg), de Thoune via Belp, de Schwarzenbourg, de Lausanne (Genève, Brigue), de Neuchâtel, de Bienne et de Soleure, sans compter celle de Worb, Berne est la plus grande gare de Suisse après Zurich et Bâle. Les nouvelles installations doubleront presque son potentiel, puisqu'elle pourra avoir trente-cinq trains à la demi-heure, au lieu de dix-huit. Le projet général prévoit aussi la construction de nouveaux bâtiments pour la poste et d'une gare pour les automobiles postales, d'une gare souterraine pour deux chemins de fer privés à voie étroite, d'un garage de cinq cents voitures automobiles et d'un centre commercial. Les nouvelles installations couvriront une surface d'à peu près quatre hectares et se répartiront sur plusieurs étages. Berne sera la première ville de Suisse à avoir une gare souterraine.

Der neue Bahnhof Bern

Der neue Personenbahnhof Bern, der gegenwärtig von den Schweizerischen Bundesbahnen gebaut wird, soll eine der modernsten Eisenbahnanlagen der Welt und zugleich ein vorbildliches Stadtzentrum werden. Die Bauarbeiten im Gebiete des bestehenden Bahnhofes begannen im Jahre 1957 und sollen im Jahre 1968 beendigt sein. Der Voranschlag sieht Baukosten von 200 Millionen Schweizerfranken vor. Als Knotenpunkt, in dem in der Richtung des Uhrzeigers Haupt- oder Nebenlinien aus Olten (Basel, Zürich), Luzern, Thun (Interlaken, Lötschberg), Thun via Belp, Schwarzenburg, Lausanne (Genf, Brig), Neuchâtel, Biel und Solothurn (Worb) direkt oder indirekt einmünden, ist Bern nach Basel und Zürich der drittgrösste Bahnhof der Schweiz. Die neuen Anlagen werden die Aufnahmefähigkeit des Bahnhofes fast verdoppeln—35 anstatt 18 Züge jede halbe Stunde. Zum Gesamtprojekt gehört auch der Bau neuer Postbetriebsanlagen mit einem Postauto-Bahnhof, die unterirdische Einführung von zwei schmalspurigen Privatbahnen, eine Einstellhalle für 500 Autos und ein modernes "Shopping Center". Die neuen Anlagen nehmen eine Fläche von ungefähr vier Hektaren in Anspruch und werden in mehreren Stockwerken übereinander gebaut, womit Bern sozusagen zum ersten Untergrundbahnhof der Schweiz werden wird.

La nueva estación de Berna

Los Ferrocarriles Federales de Suiza están construyendo en Berna la terminal más moderna del mundo. Se inició la construcción en 1957 en el sitio de la estación actual y será terminada en 1968. Se estima el proyecto a 200 millones de francos. Situada en las líneas Zürich—Ginebra y Basilea—Lötschberg—Simplón, con um empalme a Interlaken y más allá y siendo la estación central de líneas privadas a Neuchâtel, Schwarzenburg, Thun, Solothurn y Worb, la estación de Berna es la tercera estación en importancia de los FC suizos. La nueva terminal tendrá una capacidad casi redoblada—35 trenes por media hora (en la actual 18). Incluye el proyecto la construcción de una Oficina Central de Correos, una Oficina de Servicio de Cheques Postales y una estación central para el servicio suizo de camiones de correo. Se construye una estación subterránea para dos líneas privadas de trocha de 100 cm. Además un parque de estacionamiento para 500 coches y un centro de compras. El proyecto cubrirá 10 acres y se construye en diferentes pisos. Será la primera estación subterránea de Suiza.



View of the main signal box showing platform for the control desk

Berne Terminal cont.

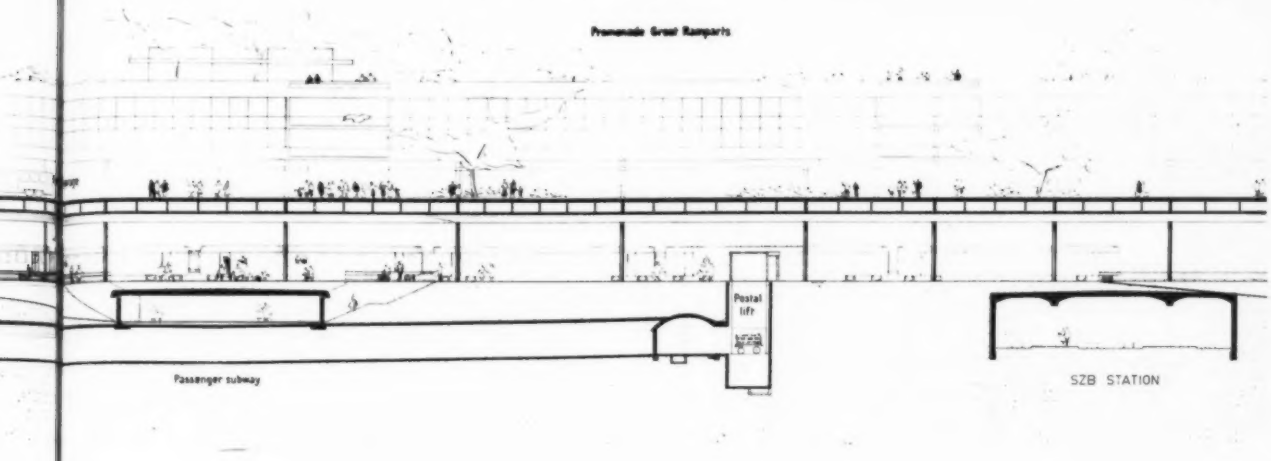
the longest Swiss train and accessible to passengers from a subterranean cross-passage, 16 m long, by means of stairs or ramps with an inclination of 11%.

• Creation of an interconnected system of subterranean tunnels below the station sidings for the movement of luggage and postal parcel trolleys that will reach the station platforms over ramps with an incline of 8.5‰ or the various floors of the postal buildings above the station by means of trolley hoists.

• Installation of two ultramodern signal boxes, of Siemens type, for the remote control of some 250 switches and of the corresponding signaling system. The first, or central, signal box will deal with all important lines, whereas the second, or auxiliary, signal box, situated at the western head of the station, will control trains running at that difficult spot during peak hours. The auxiliary signal box need not be manned during night hours or during periods of little traffic, the central signal box being equipped in such a way that it can control the whole station layout if need be.

• Installation of a far-reaching and comprehensive telecommunications system consisting of a network of pneumatic tubes for the distribution of service telegrams and orders as well as telephones, telewriters, optical signals and radio to link up the various station offices and their staff. The engine staff and shunters will receive orders from the signal box by means of radio, telephone and optical signals. Information will be transmitted to the public by loudspeakers; and illuminated boards, controlled from a central

Longitudinal section of the Berne terminal platform three showing the interconnected system of underground tunnels for the circulation of luggage and parcel trolleys from the station platform to the postal buildings



post, will indicate train departure time.

• Construction of station buildings with up-to-date amenities for the public consisting of a vast station hall, station restaurants, snack bars, shops, hotels, offices, and passenger subways linking up town, booking offices, the underground station of the Solothurn-Berne Railway, ordinary platforms, upper floors, postal motor-coach station, shopping center and incorporating numerous lifts and escalators.

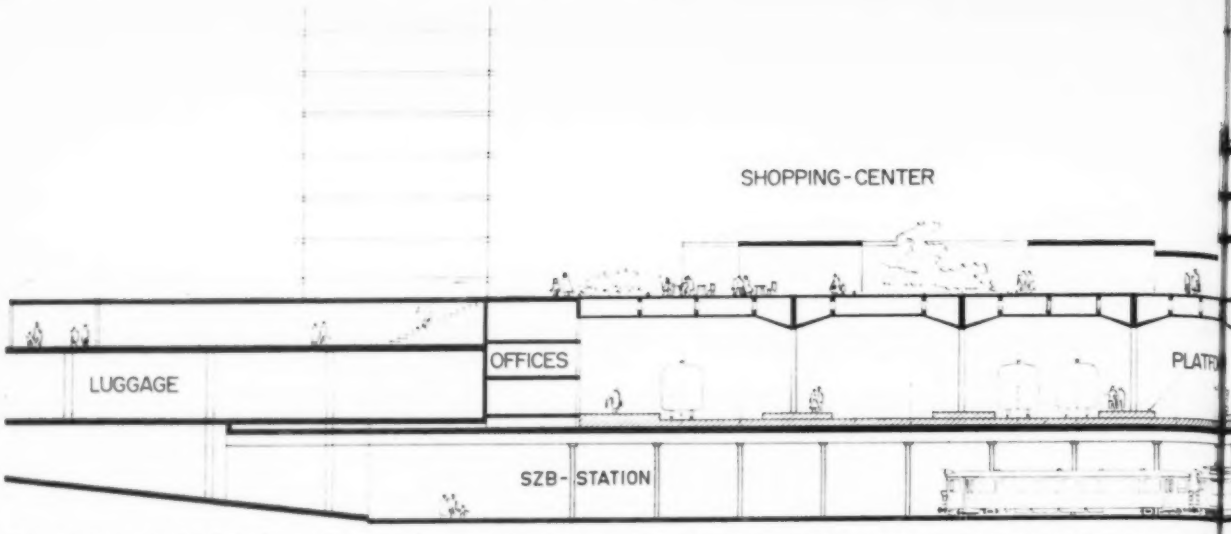
The first stage in the rebuilding of the Berne station consisted in the enlargement of the space required for station sidings. About 496,959 cubic meters of material had to be dug from the hill, the Great Ramparts, that closes in the station area on the northern side. For the building of a new bridge in pre-stressed concrete, 105 m long and 21.3 m wide, astride the western side of the station and the facing of several miles of underground work, 80,000 cubic meters of concrete and 3500 metric tons of steel have been used so far. The engineers have already had to tackle many problems, such as the placing of the enormous weight of the proposed garage on steel columns, 49.4 cm in diameter, each of which has to bear a weight of 2000 metric tons.

One of the more interesting jobs is the boring of the Donnerbühl tunnel, by means of which some private lines can be brought into the station without crossing other tracks. The rather difficult location in which this tunnel had to be bored—a built-up area; in morainic and noncoherent ground with depths of only 3.04 to 10 m between the tunnel and the buildings above; the presence of a subterranean sheet of water at main track level—called for the application of the shield method of construction without compressed air. This procedure gives maximum security in noncoherent sandy ground which cannot be stabilized by artificial freezing, or grouting, and is not likely to settle satisfactorily.

In our case, the welded shield, weighing about 185 metric tons, has the form of a cylinder of about 5.4 m deep, with a diameter of about 10 m. The cutting edge is re-inforced with an inner circle of steel, a steel crown, to give the whole shield a greater rigidity. This crown serves, at the same time, as point of support for the 32 hydraulic jacks, distributed over the periphery of the shield, which together exert a force of 3200 metric tons from the pressure of 5880 p.s.i. (400 atmospheres) supplied by the pumps. In view of its large cross-section, the shield includes three galleries, re-inforced by three vertical separations; it is thus divided up into 12 working compartments. Some of the intermediate gallery sections are movable; they can be pushed forward or backward by means of hydraulic jacks.

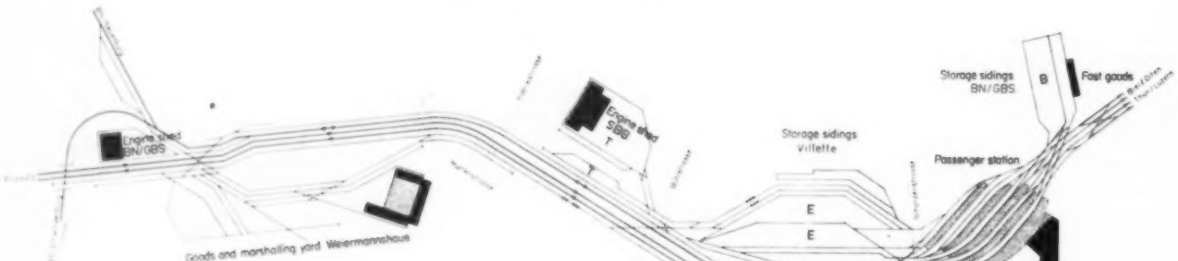
Continued

New track layout and concrete platforms for the garage are under construction



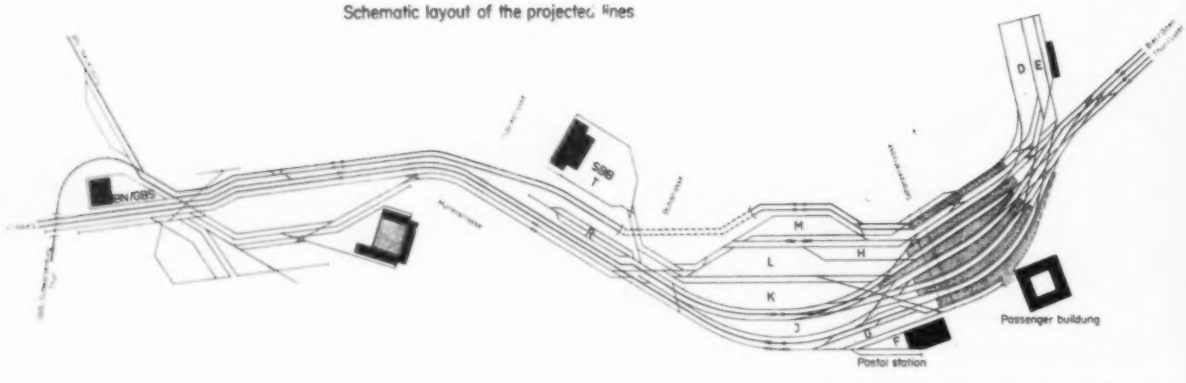
Cross section of the Solothurn–Berne underground railway station showing position of the new terminal auto-garage, train arrival

Schematic layout of the existing lines

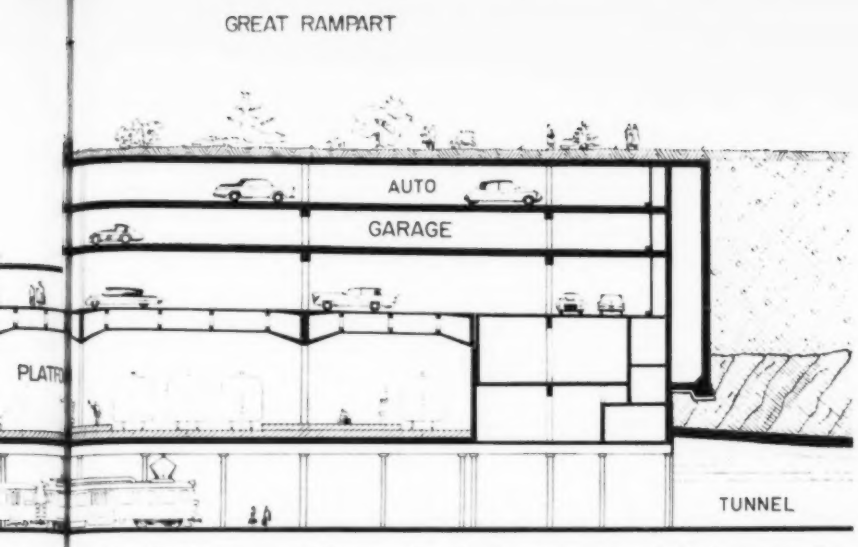


Situated on the Zürich–Geneva and Basle–Lötschberg–Simplon trunk lines, with a branch to Interlaken and beyond, and as the originating point for five private railways, the Berne terminal receives and despatches 650 trains every day

Schematic layout of the projected lines

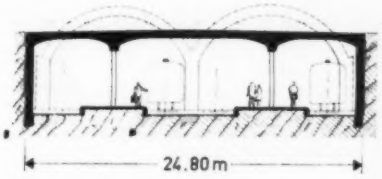


Capacity of the present station is 18 trains every half hour. This will eventually be increased to 35 by construction of a double track to the goods station, two new tracks solely for private lines, and alterations to the sidings



...rival and departure platforms, the shopping center and the luggage office

Longitudinal section of the SZB station

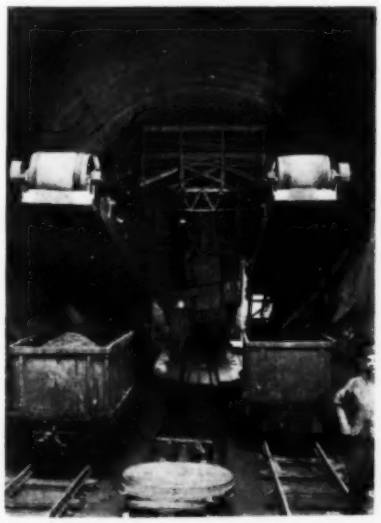


Berne Terminal cont.

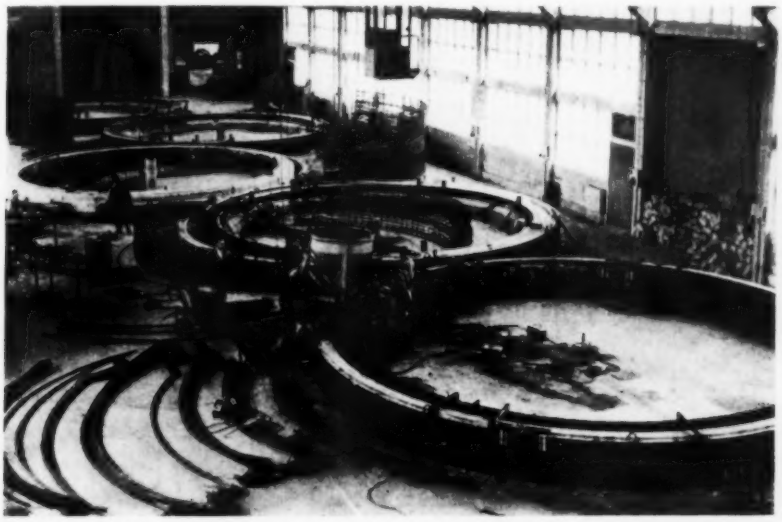
The arrangement facilitates excavation when the ground, because of its lack of coherence, has to be supported with wooden props. The rear part of the shield cylinder is not re-inforced, the thickness of its shell being sufficient to resist any pressure of the ground between the steel crown, stiffening the shield, and the end of the tunnel lining. Inside this rear part and directly applied to the end of the tunnel lining, i.e. to the sides of the concrete segments of which the lining consists, is a mobile steel circle that takes the thrust of the jacks, keeping them in the desired position and protecting the concrete segments to which this circle transmits the pressure. At the back of the shield is a platform with a hydraulically controlled revolving crane, or a kind of revolving arm that serves to put the lining segments into position.

The lining of the circular walls of the tunnel consists of pre-cast segments of re-inforced concrete. Each complete ring of the lining has an interior diameter of about 8.8 m and is constructed of four main segments plus a shorter closing segment forming the keystone. In view of the weight of the various elements to be manipulated and the required thickness of 54.5 cm, the width of the segments was fixed at 49.4 cm. The weight of the whole ring, or of all segments taken together, is about 20 metric tons. The amount of re-inforcement placed into the concrete was fixed to meet the earth pressure the tunnel has to bear. The concrete segments are manufactured inside steel frames, one complete ring of them at a time. The segments, when placed into position, are bolted together parallel to the tunnel axis. They thus maintain their position under the pressure exerted on them by the jacks that drive the shield forward and the rigidity of the tunnel is safely guarded.

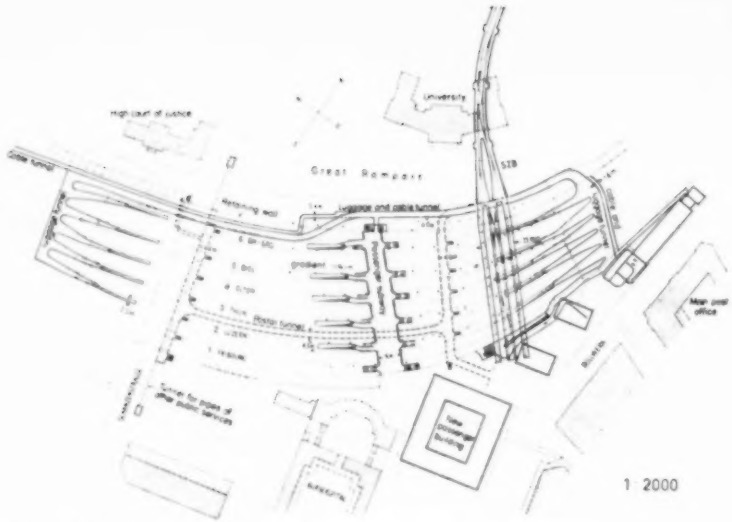
Continued



The Donnerbühl tunnel face showing the shield method of construction

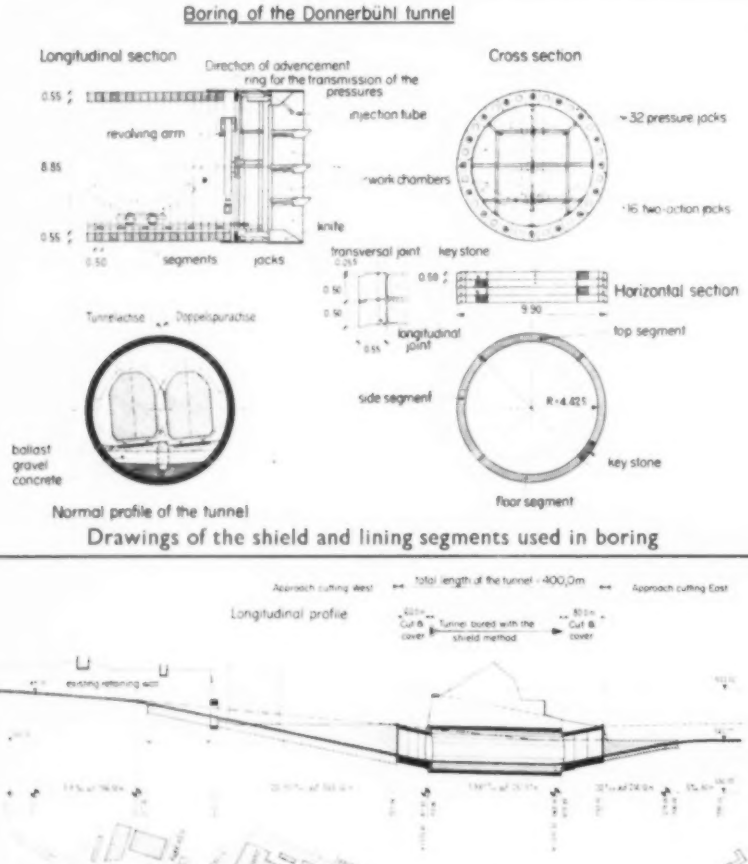


The lining of the circular wall of the tunnel consists of reinforced concrete rings, weighing about 20 metric tons and precast (above) in segments of four

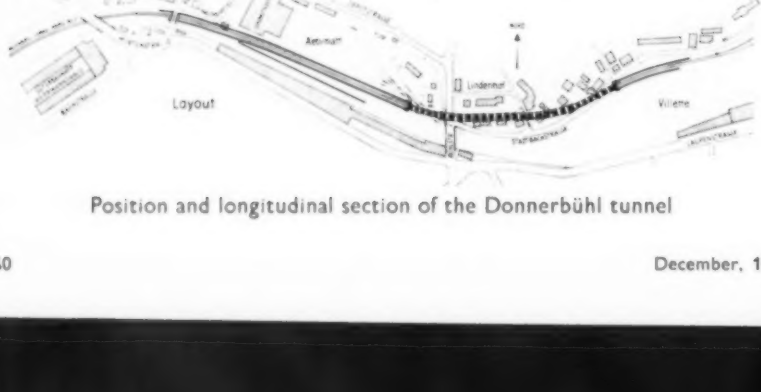


Layout of the underground plant

General plan of the new Berne subterranean installations



Drawings of the shield and lining segments used in boring



Position and longitudinal section of the Donnerbühl tunnel

Berne Terminal cont.

To prevent water, silt or mud from entering the tunnel, water-tight tape is placed into the transversal and longitudinal grooves between the segments. Furthermore, lead plates are inserted in the longitudinal joints of the segments, contributing to the integral holding of stresses bearing on the tunnel lining. As the shield is pushed forward, the empty space it leaves behind, between the lining so far completed and the surrounding earth, is filled by cement injections.

The shield is moved forward in stages about 50.7 cm at a time, by the operation of the 32 jacks. These also bring pressure to bear on the mobile steel circle covering the last segments that were put into the lining; the latter being pushed home by this proceeding, i.e. the action of the jacks serves two purposes, the moving forward of the shield and the pushing home of the tunnel lining. On the face of the heading the attack on the hill goes on continually, the sandy ground either coming off on its own accord, or being loosened with pickaxes. The excavated material is disposed of by means of trucks that are loaded by the intermediary of shoots or conveyor belts. The propping up needed, while the segments are not yet in place, is supported by the mobile galleries. The control desk, the governor valves and the auxiliary apparatus are situated within the shield, whereas the pumps are in the open, near the tunnel portal.

To put the segments into position, the mobile steel circle, resting on the side of the last ring of segments placed into position, is first jacked away, which creates sufficient space inside the rear part of the shield cylinder for the new ring of segments. The new segments, weighing about 5 metric tons each, are then placed into position by means of a hydraulically controlled revolving arm. To start with, the floor segments are put into place, then the sides are similarly lined and finally the key segment is added on top. As soon as the segments are in place, the mobile steel circle that will take the pressure of the jacks later on is shifted and pressed onto the side of the new ring of segments, the longitudinal bolts are tightened and cement is injected into the empty space between the concrete lining and the rear of the shield.

Thus a complete cycle of the procedure has been accomplished and a new move of the shield by another 50.7 cm can be initiated and carried through in the manner just described. On an average, the program provides for the placing of two rings of segments within 24 hours if a gang is working day and night.

Talgo - the First 10 Years

The Spanish National Railways (RENFE) is operating three complete Talgo trains in regular service. Two of the lightweight, articulated passenger trains have been in continuous service since July, 1950; a third since 1959. With more than 10 years' service and nearly $3^1/_2$ million kilometers to the credit of the first two trains, there are important statistics available on their operation and performance.

The Talgo equipment is pooled, working four days a week in each direction between Madrid and Hendaye on the French border—a distance of 640 km—and every other day in one direction only between Madrid and Barcelona—a distance of 690 km. Average speed over these rough terrains is approximately 79 km/h, requiring top operating speeds of 140 km/h.

Each train consists of 12 to 14 trailing units, with seating capacity averaging 139. The trains were built in the United States, to Spanish designs, by the American Car & Foundry division of ACF Industries, Inc. The locomotives are diesel-electric, powered by Maybach 650-hp engines.

For the first 10 years, the two Madrid-Hendaye trains carried 501,169 passengers. There has been a perfect safety record. Only two road failures occurred attributable to the coaching stock, neither of which resulted in more than four hours delay. On-time arrivals averaged 98.5%. Diesel fuel consumption averaged 1.40 liters per km; lubricating oil, .021 liters per km.

Coach wheels averaged 700,000 km before wear required replacement, compared to 100,000 for conventional equipment.

The entire trains, locomotives and coaches alike, are maintained by Patentes Talgo, S.A. ,under contract from RENFE in their own shops outside of Madrid. Both interiors and exteriors are in almost the same condition as when delivered from the builders.

The trains are popular with the Spanish traveling public and, despite a special Talgo fare higher than first class and a fee for seat reservations, there has been an average utilization of 60.2%.

RENFE likes the Talgos and would like to have more. Restricted capital expenditures, with emphasis on track rehabilitation and electrification, have delayed a program which envisages acquisition of 20 additional Talgo trains.

Number of journeys made	4,127
Kilometers covered	3,488,172
Number of travelers carried	501,169
Total consumption of petrol (liters)	3,896,429
Consumption of petrol for each kilometer covered	1.40
Total consumption of oil (liters)	74,645
Consumption of oil for each kilometer covered	0.021
Number of travelers per journey	121
Average number of seats available	139

Trains Talgo espagnols

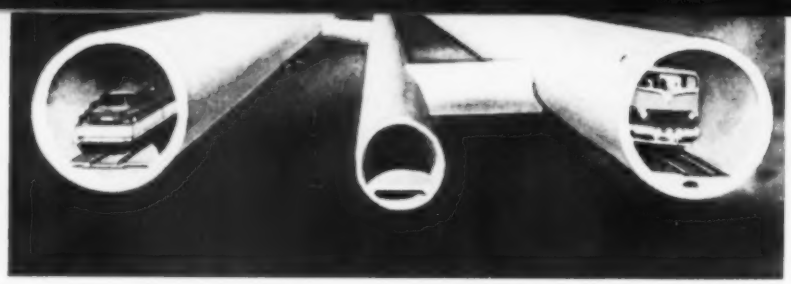
Les Chemins de fer de l'État espagnols ont trois trains Talgo en service régulier: deux depuis 1950 et le troisième depuis 1959. Comme les deux premières de ces compositions légères articulées en acier circulent depuis plus de dix ans et ont parcouru près de trois millions et demi de kilomètres, on dispose de précieuses indications sur leur comportement et leur exploitation. En dix ans, les deux trains Hendaye—Madrid—Hendaye ont transporté 501 169 voyageurs sans incidents notables. La consommation de carburant diesel est de 1,4 litre au kilomètre et celle d'huile de graissage de 0,021 litre. Les trains de roues ont été changés pour la première fois après 700 000 km et non pas après 100 000 km.

Spaniens Talgozüge

Die Spanischen Staatseisenbahnen führen drei Talgozüge, wovon zwei dieser aus Gelenk-Leichtstahlwagen bestehenden Kompositionen seit 1950 und die dritte seit 1959 im regelmässigen Dienste stehen. Da die ersten zwei Züge nun mehr als 10 Jahre zirkulierten und dabei fast $3^1/_2$ Millionen km zurücklegten, stehen wichtige Angaben über ihre Betriebs- und Leistungsfähigkeit zur Verfügung. In 10 Jahren beförderten die zwei Züge Hendaye-Madrid-Hendaye 501,169 Reisende ohne wesentlichen Unfall. Der Verbrauch an Dieselbrennstoff betrug 1,4 Liter und an Schmieröl 0,021 Liter pro km. Die Wagenradsätze wurden erst nach etwa 700,000 km und nicht nach 100,000 km ausgewechselt.

Los Trenes Españoles Talgo

Los Ferrocarriles Nacionales de España están operando tres trenes completos TALGO en servicio regular. Dos de estos trenes de pasajeros, ligeros y articulados, han sido en servicio desde julio 1950, el tercero desde 1959. Habiendo servido los dos primeros durante 10 años con un recorrido total de 3 millones de kilómetros y medio, datos estadísticos interesantes están disponibles. Durante estos 10 años los dos trenes recorriendo entre Madrid y Hendaye trasportaban 501.169 viajeros con un perfecto record de seguridad. El consumo medio de fuel-oil era de 1.4 litros por km. Después de un kilometraje medio de 700.000 la renovación de las ruedas era necesaria (en lugar de 100.000 km.).



Tunnel Project Get

The possibility that the British and French governments will sanction the construction of a link across the English Channel—either a bridge or tunnel—is becoming stronger. Both bridge and tunnel groups are now actively lobbying for support of their respective plans in the two countries. The bridge project is strongly supported by French road haulage interests. The proposed tunnel, on the other hand, has the support of the British and French railways. At a recent press conference, the chairman of the Channel Tunnel Co., Mr. Leo D'Erlanger, put forward a strong case for his group's project.

According to the Channel Tunnel Co., the advantages of a tunnel as opposed to a bridge across the Channel linking France and England are these:

- Lower construction costs—thereby offering investors a better return on their investment.
- Lower maintenance costs.
- No interference with shipping or navigation.
- Immunity to adverse weather.

The plan proposed by the Channel Tunnel Study Group calls for two main single-track tunnels, each with a diameter of 6.5 meters and a service tunnel 3.3 meters in diameter. The two single-track tunnels would be connected about every 11 km by two crossovers which a train could negotiate at speeds up to 65 km/h. Tracks would be electrified at 25 kV 50-cycles AC and there would be a clearance height of 4.4 meters above the track. Automatic block signaling installed for "both way running" would enable the tunnel to handle traffic irrespective of maintenance requirements. Signaling would be based on a maximum train speed of 140 km/h and trains could be operated at an average speed of 104 km/h on a three minute headway. The tunnel would be 53 km long and have a maximum gradient of 1 in 100.

Trains would be in five categories: express passenger, ordinary passenger, accompanied vehicle, fast freight, ordinary freight. They would range in tonnage from 600 for an express passenger train to 1500 tons for an ordinary freight train.

Considerable interest centers, of course, on the accompanied vehicle trains for the movement of motor cars, commercial vehicles and buses. Accompanied motor cars would be conveyed in trains of covered vehicles designed so that a car can be driven straight through from one end of the train to the other. Drivers and passengers would remain in their vehicles throughout the tunnel journey so that they could drive off immediately on reaching the tunnel terminal. A single-deck train would carry 150 motor cars or 64 large vehicles (buses, commercial vehicles, caravans, etc.). A double-deck train would take 300 motor cars. Car-sleeper services could also be operated with ease to virtually any destination in Europe. Terminals and timetables would be based on the assumption that motor car owners would not suffer any delays nor would they have to reserve space in advance.

The cost of taking a car through the tunnel would be cheaper than the existing sea ferries and very considerably cheaper than the air ferries. A medium size motor car and driver would be charged roughly 30% less than the existing British Railways' ferry rates between Dover and Boulogne. Later these fares could, it is anticipated, be reduced even further.

Long distance passenger trains of Continental rolling stock, which now start at Calais, would work through the tunnel and start and end their journeys at the British terminal where connecting BR services to London would be provided.

Simplified models of the proposed British tunnel terminal showing (left) an example of the loading dock and (right) the approach to the tunnel terminal. In practice auto-carriers will be covered and not open

ect Gets SNCF and BR Backing

In addition there would be through passenger trains from London to Paris and Brussels, made up of rolling stock designed for operation on BR, SNCF and SNCB systems.

Locomotives would be multi-frequency electrics capable of picking up current at 750 volts DC from BR's Southern Region third rail network or, via pantographs, from the 25 kV AC system through the tunnel and in France. (Belgian services would change locomotives at Lille.)

The London-Paris trip would be accomplished in four hours 20 minutes of which the English sector would occupy 80 minutes, the journey through the tunnel 30 minutes and the French sector 150 minutes. The London-Brussels trip would take a total of four hours 50 minutes.

Freight traffic would be handled with the ever increasing fleet of "ferry" cars which are suitable for operation on BR's more restricted loading gauge.

The capacity of the tunnel, based on a conservative five-minute headway and an 18-hour operating day, is put at 216 trains in each direction. At peak periods it is estimated that 3600 motor cars per hour in each direction could be handled—this is equal to a four lane motorway. Some idea of the capacity of the tunnel, as planned, can be judged from the fact that all the road vehicles which crossed the channel in 1960, by sea and air, could be cleared through the tunnel in three or four days.

The cost of the tunnel has been put at £105 million—as opposed to £210 million for the cost of a bridge. On the bridge sponsors' figures the bridge would provide an effective yield of less than 3% for the first 12 years of operation. The tunnel would provide a return of more than 6% from the date of opening. The average return on the investment over 20 years from the date of commencing construction is expected to be not less than 10%. The tunnel group appears confident that there would be no trouble in raising capital on the international money markets on these terms.

In connection with the press conference, held under the auspices of the Channel Tunnel Study Group, the British Transport Commission showed a 9 meters by 2.4 meters working model of the proposed British tunnel terminal.

Although it has, for space considerations, been simplified, it provided an effective illustration of the proposed method of operation.

An artist's impression of the digging head and earth conveyor system that would be employed by the Channel Tunnel Co. for construction work

Projet de tunnel sous la Manche

Il y a de bonnes raisons de penser que les gouvernements français et anglais donneront leur accord à la construction d'un pont ou d'un tunnel entre leurs deux pays. Les intéressés français au trafic routier appuient fortement le projet de pont, tandis que les chemins de fer français et britanniques préféreraient un tunnel. D'après les indications de la "Channel Tunnel Company", il serait moins coûteux de construire et d'entretenir les deux tunnels à une voie prévus, y compris la galerie de service spéciale, qu'un pont. Ces tunnels, au demeurant, n'entraveraient pas la navigation, ni les bateaux; ils rendraient la circulation des véhicules absolument indépendante des intempéries.

Aermelkanal-Tunnelprojekt

Es bestehen gute Aussichten, dass die Regierungen Frankreichs und Grossbritanniens dem Bau einer Brücke oder von Tunnels zur Verbindung ihrer Länder zustimmen werden. Das Brückenprojekt findet die starke Unterstützung französischer Strassentransport-Interessenten, während die französischen und englischen Eisenbahnen den Tunnelbau bevorzugen. Nach den Angaben der Channel Tunnel Company liessen sich die zwei vorgesehenen einspurigen Tunnels samt einem besonderen Dienststollen mit weniger Kosten bauen und unterhalten als eine Brücke. Diese Unterführungen würden die Schiffahrt und Navigation nicht beeinträchtigen. Ferner wäre der Verkehr durch Tunnels von jeder Witterung unabhängig.

Proyecto de un Túnel bajo la Mancha

Hay esperanza de que los gobiernos británico y francés autoricen la construcción de un puente o un túnel a través de la Mancha. Un grupo francés de transportadores de carretera sostiene el proyecto del puente. Por otro lado, los ferrocarriles británico y francés interceden en favor del túnel. Según la Channel Tunnel Co. la construcción y la conservación del túnel que consistiría de dos túneles de vía sencilla y un túnel de servicio, costarían menos que las del puente y no pondría obstáculos a la navegación. Además, la intemperie no impediría el tráfico.

For the Tokaido line, JNR is developing a new

Automatic Train Control System

by Hajime Kawanabe

Since trains will move at high speed and at a high traffic density on the new Tokaido trunk line, it is obviously vital to ensure safe and smooth operation, by means of signaling. This implies that signals cannot rely on the wayside system alone, but must combine the cab signal and the automatic train control system.

With this in mind, the first trial manufacture of a 5-indication automatic train control system was started in March 1959. The second trial manufacture of a 7-indication automatic train control equipment was made exactly one year later, in March 1960. Service tests gave excellent results, and at present a third trial manufacture is under way.

The following article, reprinted by permission of Japanese Railway Engineering, gives a rough outline of the experimental 7-indication automatic train control equipment.

The operation system on the new Tokaido trunk line is being generally planned as follows. The maximum speed of the passenger trains will be 200 km/h (250 km/h eventually); the maximum speed of freight trains is 150 km/h, and minimum train interval of limited express trains will be 5 minutes.

Let us assume that the rate of speed reduction from 200 km/h to 150 km/h is 2 km/h/s, the rate of speed reduction from 150 km/h to stop is 3 km/h/s (future rate of speed reduction from 250 km/h to 200 km/h would be 1.8 km/h/s), the error of the speed checker is 3%, and the braking dead time is 4 seconds (2 seconds for signal aspect change, 2 seconds for braking force to work).

Let the relation between the limited speed and the cab signal aspect be 200, 150, 110, 70, 30, 30 km/h and 0 km/h respectively for G, YG, Y, YY, YR, R and RR. The relation of cab signal and train speed in case of the train stopping between stations, as shown in Fig. 1, is founded on the 4-indication principle but when speed limit sections (110 km/h and 70 km/h) are included on the way, the 5-indication or the 6-indication principle becomes the basic principle. Again, the relation between the cab signal and the train speed when stops are made at stations is shown in Fig. 2. At the station a 70 km/h speed limit is established at the turnout point, B-point established at a spot 405 meters before the home and the starting signals, and an absolute stop signal (RR) is established 80 meters before the starting signal.

It has been decided that the wayside signals on the new Tokaido trunk line will be only home signals and starting signals, and the wayside signals between stations will probably be abolished.

JNR engineers are designing equipment capable of operating at 200 km/h for the Tokaido line. Above is the "Vista" train, now

Between stations, track circuits of 2.5 km or 1.5 km are to be established as conditions dictate. As the new Tokaido trunk line will be electrified at 60 c/s (or 50 c/s), 25 kV alternating current, the track circuit system will be an audio-frequency track circuit in the vicinity of 1 kc frequency. Germanium transistors (silicon transistors in the future) are to be used in the transmitters and receivers, and the amplitude modulation of the audio-frequency carrier wave is to be made with the rectangular form low-frequency modulation wave.

Signal carrier frequencies of 700 c/s and 900 c/s are to be alternately distributed on the track circuit of the up-bound line in the 50 c/s section, while on the down-bound line 1100 c/s and 1500 c/s are to be alternately distributed. (In the third test manufactured equipment, 700 c/s and 900 c/s are to be adopted on the up-bound line of the 50 c/s section, 800 c/s and 1000 c/s for the down-bound line.) For modulation frequencies, 10, 15, 25, 33, 41 and 0 c/s (i.e. non-modulated) frequencies are to be used respectively for cab signal G, YG, Y, YY, YR and RR. The absence of current corresponds to R.

In the transmitter, the oscillation frequency is changed by switching the C of the LC oscillation circuit. (The carrier frequency of the third test manufactured equipment is obtained by frequency mul-

Continued

ration on Japan's Kinki Nippon Railway

Télécommande au Japon

Sur la nouvelle ligne de Tokaido, au Japon, il circule tellement de trains à une vitesse élevée qu'un système de signalisation ad hoc est indispensable pour assurer une exploitation sûre et normale. La signalisation ordinaire devait donc être complétée par des signaux dans la cabine du mécanicien et la télécommande. En mars 1959, on commença l'essai de dispositifs de télécommande comprenant des signaux à cinq significations et, un an plus tard exactement, à sept significations. Les essais donnèrent de bons résultats, de sorte qu'on a maintenant passé à la troisième phase de développement. Notre article décrit les dispositifs d'essai de la télécommande et les signaux à sept significations; diverses modifications ont conduit à un troisième procédé de fabrication. Comme le courant de traction de la nouvelle ligne de Tokaido, électrifiée en courant alternatif, aura probablement mille ampères, les interférences du courant de traction irrégulier seront particulièrement fortes. Aussi les relais des tronçons de rails isolés et des signaux des cabines de mécanicien doivent-ils y être adaptés.

Japans signaltechnische Fernsteuerung

Die vielen Züge, die auf Japans neuer Tokaidolinie verkehren, und ihre hohe Fahrgeschwindigkeit verlangen ein entsprechendes Signalsystem, wenn sich der Betrieb sicher und reibungslos abwickeln soll. Das gewöhnliche Streckensignalsystem musste daher durch Führerstandsignale und die Einführung der signaltechnischen Fernsteuerung vervollständigt werden. Im März 1959 begann denn auch die versuchsweise Herstellung der Einrichtungen für die signaltechnische Fernsteuerung mit 5 Signalbegriffen und, genau ein Jahr später, mit 7 Signalbegriffen. Die durchgeführten Betriebsversuche ergaben gute Resultate, und gegenwärtig ist die dritte Entwicklungsetappe im Gange. Vorliegender Artikel beschreibt die Versuchseinrichtungen für die signaltechnische Fernsteuerung mit 7 Signalbegriffen, wobei verschiedene Änderungen zu einem dritten Herstellungsverfahren geführt haben. Da der Fahrstrom der neuen Tokaidolinie, die mit Wechselstrom elektrifiziert wurde, vermutlich 1,000 Amperes aufweisen wird, werden die Interferenzspannungen des ungleichmässigen Fahrstromes besonders stark auftreten. Die Relais der isolierten Geleiseabschnitte und jene der Führerstandsignale müssen deshalb diesen Verhältnissen gewachsen sein.

Introducción des sistema del mando automático en el Japón

Como los trenes en la nueva línea principal de Tokaido recorren a alta velocidad y con gran intensidad, es evidentemente de suma importancia que se obtenga una operación segura y regular por la señalización. Esto significa que la señalización no puede contar con el mero sistema del lado del camino, sino que se ha de combinar la señalización en la cabina y el mando automático. En marzo 1959 se comenzó la fabricación de un sistema experimental de 5 indicaciones. Precisamente un año después, en marzo 1960, se fabricó el segundo equipo experimental. Las pruebas dieron excelentes resultados y se está fabricando hoy el tercer equipo experimental. Este artículo da un epítome del equipo experimental de 7 indicaciones. Se han introducido perfeccionamientos y se está fabricando hoy el tercer equipo de ensayo. Como la nueva línea de Tokaido será electrificada en C.A., siendo la corriente de tracción de 1000 A., el voltaje de interferencia resultante de corriente de tracción desequilabrada llegará a ser muy alto. Por eso, los circuitos de vía y el equipo de señales de cabina han de compensarlo eficazmente, y los relés del circuito de vía y de la señal de cabina han de constituir un sistema que no causa inestabilidad.

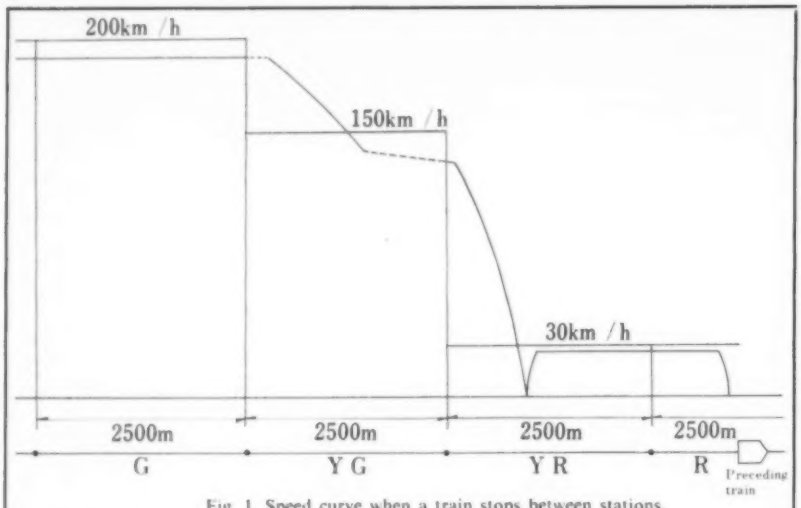


Fig. 1. Speed curve when a train stops between stations.

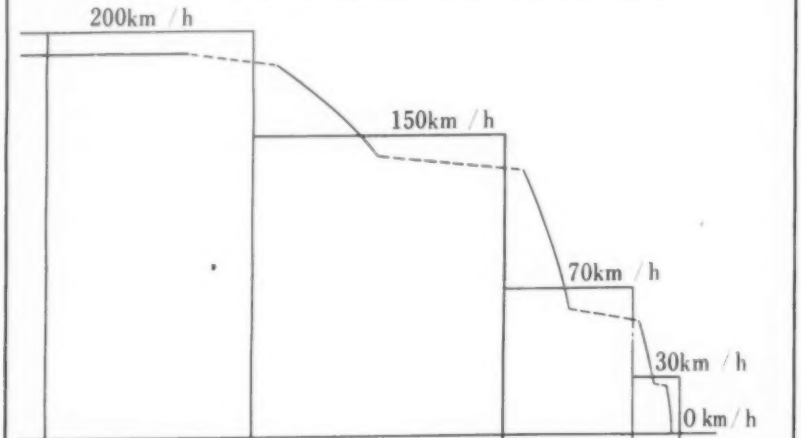


Fig. 2. Speed curve when a train stops at a station.

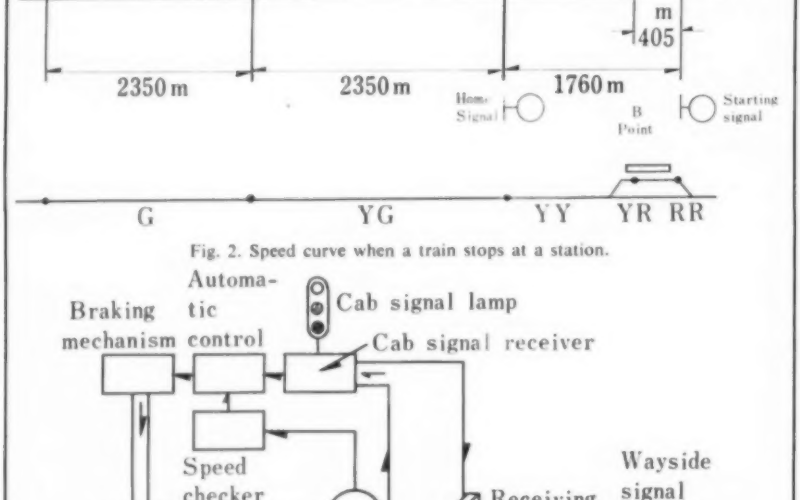


Fig. 3. Composition of automatic train control equipment.

tiplication of the 50 c/s overhead current frequency, while the modulation frequency is obtained from the LC oscillation or the beat of mechanical oscillator.)

In the standard track circuit, if a voltage of 2.4 V (1 kc) is imposed between the rails of the sending end, a voltage of over 0.03 V is transmitted to the rails at the receiving end, 2.5 km away. In the receiver, selective reception of the respective carrier frequencies is made through the band-pass filter, these frequencies are amplified, detected by the diode, passed through the voltage limiter for selection and amplification according to modulation frequencies, and excite the direct current relays. (In the third test receiver the heterodyne reception system is being contemplated.) In this system, the frequency obtained by frequency multiplication of the 50 c/s overhead line current frequency is used to change the forementioned carrier frequency in the vicinity of 100 c/s to an intermediate frequency of 100 c/s or 200 c/s, and then the demultiplied frequency is detected.

The aforementioned systems are both of the DSB (double side-band) system but one system in the third test manufacture is now being made on the SSB (single side-band) system by which only a single side-band is transmitted to the rails.

In this system the 50 c/s overhead line current frequency and the frequency obtained by its frequency multiplication is used as the pilot for the transmitter and receiver. For instance, the lower side-band of 550 c/s (600 — 50) and the upper side-band of 650 c/s (600 + 50) are alternately distributed on the track circuit of the up-bound line in the 50 c/s section, and the lower side-band of 550 c/s (600 — 50) and the upper side-band of 950 c/s (900 + 50) are alternately distributed on the track circuit of the down-bound line. For modulation frequency 5, 8, 12, 19, 26 c/s and 33 c/s are used, while modulation and demodulation, ring modulators and filters are used.

The forementioned signal current of the track circuit which flows in the rails is received by the receiving coils in the cab. Two horizontal type receiving coils are used and when the rail current is 50 mA, a voltage of 10 mV is induced in the cab. (In the third test equipment, a system of one vertical receiving coil is being tried.) The mechanism of the cab receiver is practically the same as that of the wayside track circuit receiver with the difference that in the cab receiver, the receiving coil and band-pass filter are respectively switched for use for up-bound and down-bound directions. (In the third test manufacture equipment, for instance,

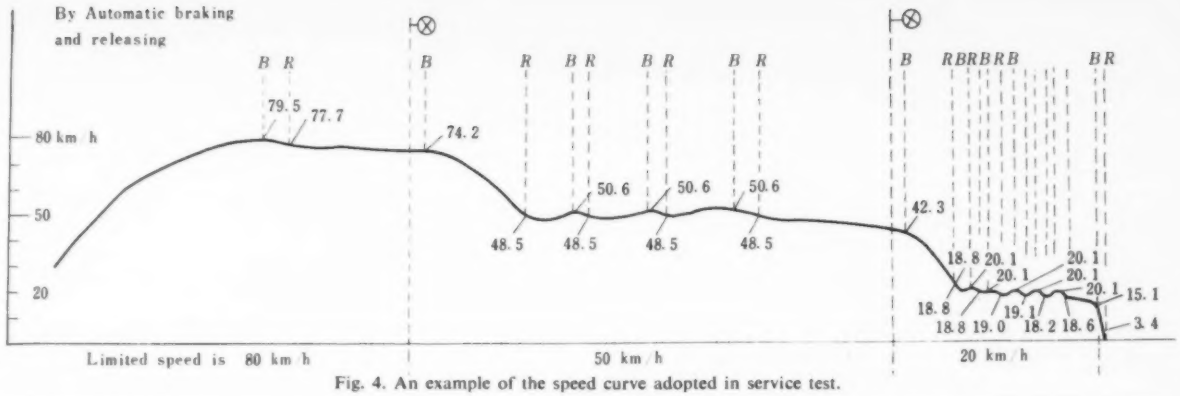


Fig. 4. An example of the speed curve adopted in service test.

700 c/s and 900 c/s are received for up-bound runs and for down-bound runs, 800 c/s and 1000 c/s are received.)

The speed checker is a device by which one can easily check whether or not the speed at any optional instant is above or below the limited speed permitted in that certain section. In the second test manufactured equipment, the trial production of the electrical type, mechanical type and air micro type were made, the electrical type giving the best results.

In the electrical system, the alternating current voltage proportional to the revolutions of the car wheel is generated by a generator connected to the car axle. This voltage is rectified into direct current and compared with the direct current voltage proportional to the limited speed. Transistors are used in the electric circuits. (To make this equipment fail-safe, in the third test manufactured equipment, a check circuit was added to check wire disconnections in the circuit.)

As this is actually a new version of the conventional speedometer, it can also be used advantageously as a speedometer. The electrical type can easily compensate for error due to wearing out of the car wheels and is capable of cutting the overall error to within 2%.

In the mechanical type, the revolutions of the car wheels are reproduced in the cab by the flexible shaft and are integrated every $^2/_3$ seconds to deflect mechanically the needle of a remodelled speedometer. Its mechanism is such that cams equivalent to the limited speed are attached to the revolving axis of the speedometer needle. When the train speed goes up, the cams, in turn, gradually open the relay contact point.

In the air micro system, the slit in the nozzle of a pneumatic tube is changed by the revolutions of the car axle and the pressure in the pneumatic tube is decreased in proportion to the speed. This pressure is compared with the standard pressure which is proportional to the limited speed.

As shown in Fig. 3 automatic train control equipment consists of a cab signal, speed checker, automatic control equipment and braking mechanism. The limited speed prescribed by the cab signal and the present speed indicated by the speed checker are compared, and if the latter surpasses the former an alarm is sounded, a red light goes on, and the automatic brake goes into action immediately.

Test manufacturers were made of two systems; namely, one in which the automatic control does not go into action if the operator uses the hand brake within three seconds after the sounding of the alarm, and the other in which the automatic brake immediately goes into action without the three seconds allowance time. The latter system is to be adopted on the new Tokaido trunk line. This system is actually a step in the direction of the automation of train operation.

In the former, the alarm immediately stops when the operator brakes the car by hand, but the red lamp continues to be lit until the train speed falls below the limited speed, returning to white only when the train speed becomes lower than the limited speed. If the operator releases the hand brake while the red lamp is still on, the alarm goes on again and the automatic brake goes into action after three seconds. Both the bell and the whistle have been test manufactured for this system.

A system in which the brake is released automatically when the train speed becomes lower than the limited speed, and another system in which the release is made only when the operator pushes a button, has also been test manufactured. The former is to be adopted on the new Tokaido trunk line. By a simple change of a part of the relay circuit, it can be so devised that the brake cannot be released until a temporary stop is made only for a permissible stop signal YR (limited speed 30 km/h). The relay type is simpler in structure compared to the electronic type and besides being able to easily satisfy the fail-safe requirement, it is highly reliable.

Good results were obtained when the aforementioned automatic train control equipment from the second test manufacture was mounted on the MOHA 100 Type and 101 Type electric cars and tested on the Tokaido trunk line. However, in this case, the limited speed was changed to the four steps of 80, 50, 20 km/h and 0 km/h (absolute stop), and for the speed checker, an electrical system was used. The Fig. 4 is an example of the system in which the automatic control goes into action immediately when the limited speed is surpassed, and is automatically released when the car speed falls below the limited speed.

The automatic train control equipment which was test manufactured in March, 1960, is outlined above, but revisions have now been made and the third test manufacture is being made. As the new Tokaido trunk line is to be electrified in alternating current and its traction current is expected to be 1000A, the interference voltage occurring from unbalanced traction current will become particularly large. Therefore, the track-circuits and cab signal equipment must be able to handle these efficiently, i.e., the relays of the track circuit and cab signal must be in a system which will not cause instability due to the higher harmonics arising from the forementioned interference current.

Moreover, with the exception of automatic control equipment of the relay type, the forementioned systems are of the electronic type using many transistors, thereby making it imperative that the electric circuits be simplified as much as possible, the parts fully examined, and the reliability of the equipment improved. Studies are also being made on methods enabling automatic switching to emergency spare units when equipment fails, besides systems to concentrate ground equipment in one place.

US Road Mechanizes Spot Tamping

A major US railway, the Erie-Lackawanna, has mechanized spot-tamping work over the entire system. Teams of equipment —each team consisting of a spot-tamping machine and a Nordberg Midget Surfacer for "sighting" low spots—has helped increase production per employee and improved work quality. The railway's roster of track equipment, much of it delivered new in 1961, includes 38 Fairmont and 7 McWilliams spot tampers, and 21 of the Midget Surfacers.

When the Erie and Lackawanna railways were merged into a single system in late 1960 a number of special problems were created—staff relocations, realignments of responsibilities, consolidation of equipment rosters and, among other things, changes in methods of track and roadway maintenance.

Combining the two railways required that track forces be reorganized around the needs of the new and larger system. There was an initial need to eliminate duplication which naturally existed when the two carriers were operated as separate companies. Once this was done, it became apparent that mechanization would permit lengthening of the territories assigned to track crews.

For example, spot-tamping work carried on by the two railways prior to the merger was done with hand-held pneumatic tampers or tamping guns of the older gasoline-driven, self-contained type. Sighting was done by the foremen by eye. This not only placed heavy reliance on individual judgment and experience of foremen, but also was not conducive to uniform work. Moreover, the handwork approach imposed limits on the amount of work performed.

Engineering forces on the new Erie-Lackawanna took steps soon after the merger to improve these conditions. The need for more uniform work at all locations was one goal; and if each crew was to perform more work over the longer territories, greater mechanization was required.

Thus it was that the railway's management decided to purchase modern spot-tamping machines, and, with these, a sufficient number of Midget Surfacers.

The latter machines are wire-type "sighting" devices, designed primarily for locating and correcting irregularities in track surface. The "sighting" wires, mounted on small two-wheel buggies, are 15.2 m long. An assembly containing a scale and pointers for indicating and measuring track irregularities is mounted on a four-wheel buggy 6 m ahead of the rear buggy.

A total of 21 of these surfacer units were obtained; all were delivered before the close of the 1960 work season. Initially, the new units were placed in service in company with production tampers which were being used in spotting work. When the new spot tampers began to arrive on the railway in April of this year, the Midget Surfacers were assigned for use with them.

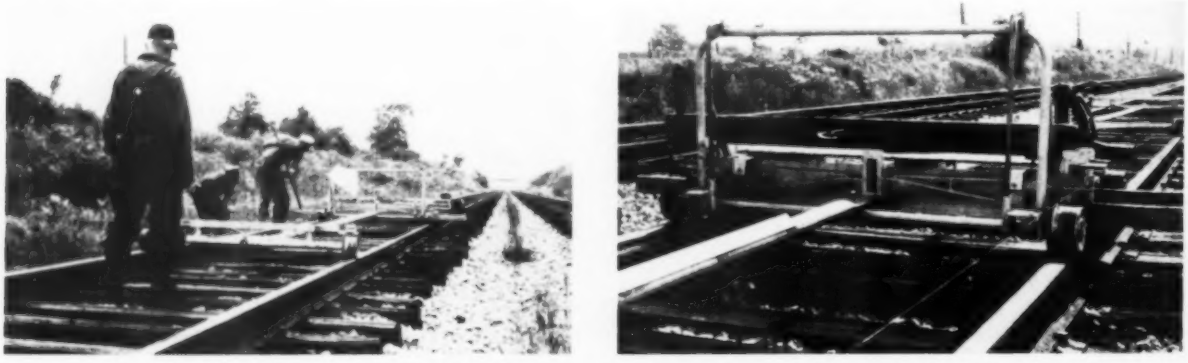
The Erie-Lackawanna's Marion Division, which is a key segment near the center of the railway system, provides an example of how the new machines are used. This division has approximately 400 km of double-track line and 96.5 km of single-track. It is maintained by nine section crews, seven of which were each assigned a spot tamper. The two sections which did not receive a machine include a terminal gang and a section where tracks are used jointly by the E-L and a neighboring railway, the Chesapeake & Ohio. This latter trackage is intensively utilized and the use of spot tampers is considered impracticable.

Three of the Midget Surfacers were assigned to the Marion Division. Being in the minority, these are distributed among the track crews, as needs indicate, by the division engineer. As quickly as a surfacer completes its work on one section, it is moved to another. In recent weeks, all three surfacers on the division have been working on track which is scheduled to be sleepered and surfaced in 1962.

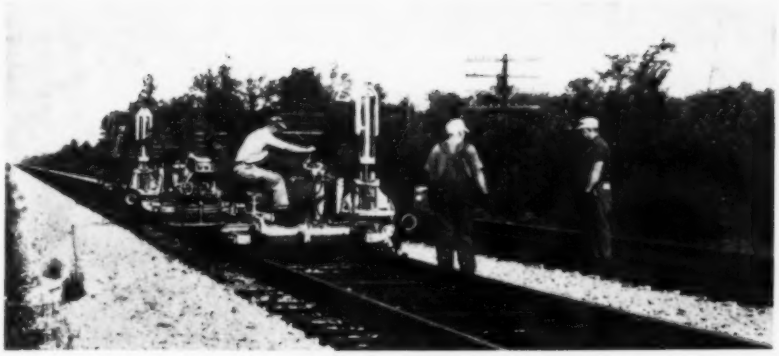
The normal section gang on the Marion Division consists of a foreman, machine operator, truck driver and three trackmen. Frequently, a gang will have an assistant foreman, in which case one less trackman is used. When working on double-track territory, one of the trackmen or the truck driver is assigned to flag; on a single-track line or trackage under CTC control, the section crew uses the track under a work order.

On a recent field trip to observe work in progress, it was noted that the truck driver was serving as flagman; the foreman and two trackmen were working with the surfacer, and the operator and one trackman were doing tamping work.

When working with the Midget Surfacer, E-L practice is to push the



Foreman (left) halts the Nordberg Midget Surfacer when the pointers (right) reveal a low spot. Here the pointers indicate that the joint in the left rail is .3175 cm low; the right rail less than .3175 cm low.



The two Fairmont spot tampers photographed above while working in tandem were among the modern machines purchased by the Erie-Lackawanna railroad

device along the rails until one or both pointers on the indicator show a low spot of at least 6.35 mm. Deflections less than this are usually not raised. But where a low spot is found, the device is stopped and the sleeper at the lowest point is jacked up until the pointer shows it to be 6.35 mm high. An over-raise of this amount is considered sufficient to allow for the settlement which occurs when the first train passes.

One trackman, or the assistant foreman, pushes the Midget Surfacer while the other trackman handles the track jack. The foreman watches the pointers of the indicator and marks the sleepers which are to be tamped. Usually, five or six sleepers must be tamped to eliminate a low spot.

The tamper operator then moves his machine into position and makes from one to four insertions of the tamper tools at each sleeper which has been marked. The sleepers which are most distant from the low spot generally receive one or two insertions; those at the low spot three to four.

The trackman who assists the operator then forks ballast to the tamping tools. (On the E-L crushed stone ballast is used.) In addition to the assistance he gives in this manner, the trackman performs other duties. He helps turn the machine, which is required in the case of the Fairmont units. He also helps place the machine on a set-off if it is necessary to clear the track. A portable metal set-off is used with each tamper, and it is so located that the machine never has to run more than 1.6 km to clear for trains.

This clearing of the track in favor of passing trains is time-consuming and, as a general rule, approximately 5 hours of on-track work time can be expected in a normal 8-hour day. Production per-day usually ranges from .8 km to 1.6 km of track.

When short moves are made from one work site to another, the tamper ordinarily runs to the new site under its own power. If a move of 16 km or longer is made, the machine is either towed by a highway truck with flanged-wheel attachment, or is loaded on the truck and moved over the highway.

The division engineer on the Marion Division, after one work season with the new equipment, is well pleased with the work his track forces have accomplished. He states that uniformity of work has improved, both in the pinpointing of low spots and in tamping.

McWilliams spot tampers are used on some sections of the Erie-Lackawanna Railway. Spot-tamping outfits get about 5 hours of on-track time each day

Bourrage mécanique de la voie

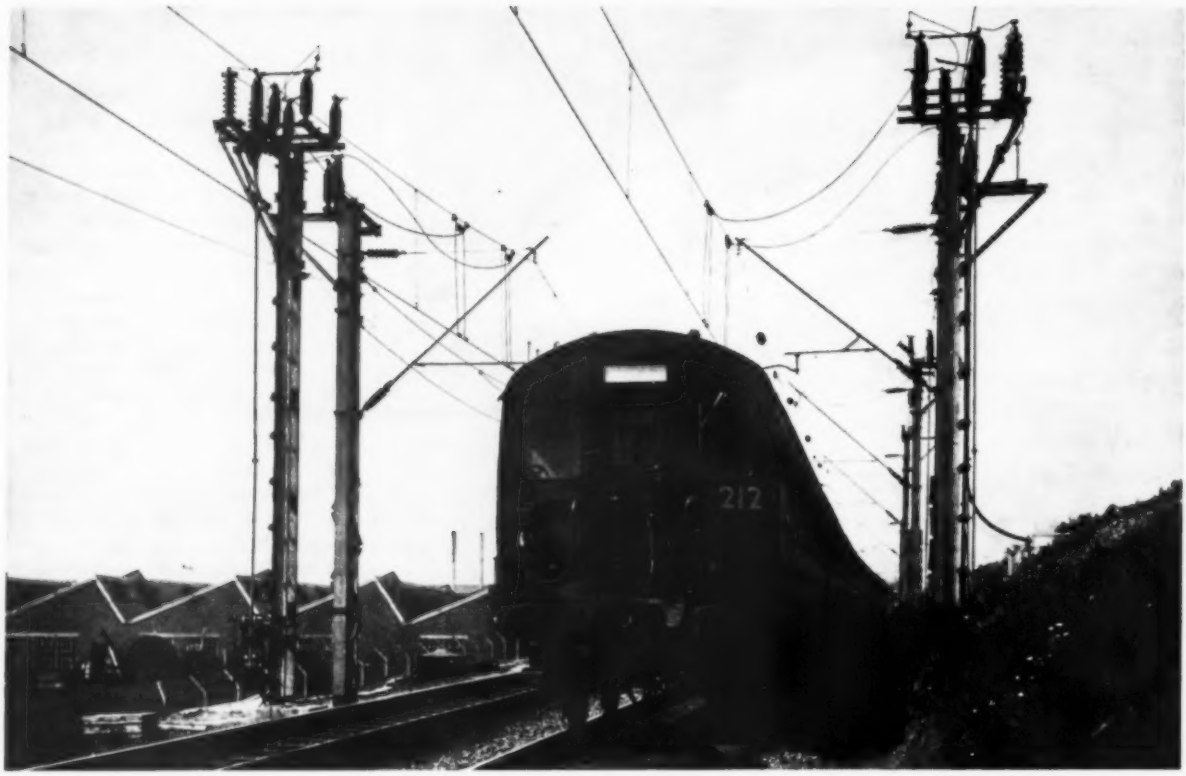
Ayant fusionné en 1960, les chemins de fer du lac Erié et de Lackawanna, en Amérique du Nord, furent amenés à adapter le service d'entretien de leurs voies aux nécessités d'un grand réseau. Ils commencèrent par mécaniser les travaux de réfection locaux. Ils sont parvenus à économiser du personnel et à obtenir un meilleur résultat en formant des groupes de travail dotés chacun d'une petite bourreuse et d'un appareil de nivellement. Cet équipement, acquis essentiellement en 1961, comprend en tout 45 petites bourreuses, dont 38 du type Fairmont et sept du type McWilliams, et 21 appareils de nivellement Nordberg-Midget. Ainsi qu'on le lira dans l'article, le nouveau procédé permet d'arriver à une assiette uniforme de la voie.

Mechanisierte Gleisstopfung

Die Erie und die Lackawanna Eisenbahnen Nordamerikas mussten nach ihrer im Jahre 1960 erfolgten Fusion der Gleisunterhaltsdienst den Bedürfnissen eines umfangreicheren Eisenbahnnetzes anpassen, wozu sie als erster Schritt die lokale Gleisausbesserung mechanisierten. Durch den Einsatz besonderer Arbeitsgruppen, wovon jede mit einer Kleinstopfmaschine und einem Nivelliergerät ausgerüstet wurde, konnte Personal gespart und bessere Arbeit geleistet werden. Die hauptsächlich im Jahre 1961 angeschaffte Gleisausbesserungsausrüstung dieser Bahnen besteht aus 38 Fairmont- und 7 McWilliams-Kleinstopfmaschinen sowie aus 21 Nordberg-Midged-Nivelliergeräten.

Apisonado mecanizado

Al fusionar los ferrocarriles estadounidenses Erie y Lackawanna en 1960 la extensión de la red obligaba a que se reorganizase la conservación de la vía. Una de las primeras medidas era la mecanización del apisonado en todo el sistema. Brigadas de equipo—consistiendo de una apisonadora y una Midget Surfacer Nordberg para descubrir sitios bajos—han aumentado la producción por obrero y perfeccionado el trabajo. El programa de compras incluye 38 apisonadoras Fairmont y 7 McWilliams y 21 Midget Surfacers. Según el ferrocarril, la uniformidad del trabajo se ha mejorado.



Electrification in Great Britain

by J. A. Broughall, Asst. Chief Electrical Engineer, BTC

As part of its modernization program, British Railways has converted from 1500 v DC to 50-cycle 25 kV AC with 6.25 kV in certain areas. Since the decision to convert to high-voltage single-phase electrification at industrial frequency was made in 1956, 1300 km of track have been equipped and 64 3300-hp locomotives and 396 motor coaches with two or three trailer cars have been delivered. As of 8 August, these units had chalked up 21 million km, 96% of it in multiple-unit trains. Work on the electrification of the London-Crewe line is now in progress. By 1966, BR expects to complete industrial frequency electrification of the London to Liverpool and London to Manchester lines. In this article, which is condensed from an address by Mr. Broughall before the recent Brazilian Federal Railways Conference in Rio de Janeiro, BR's experience with conversion to high-voltage industrial frequency is presented in some detail.

The use of the 50-cycle system presented us with some problems which have not yet arisen elsewhere. Among these are the consequences of the multiplicity of overbridges and tunnels and the existence of a complicated Post Office telecommunication network which continues to expand with equipment using earth return circuits. In addition, our climate is notoriously poor. Considerable atmospheric pollution still exists, though the spread of smokeless zones and the rapid elimination of steam locomotives in favor of diesel and electric locomotives and multiple-unit trains already gives promise of a continuing improvement. Above all, however, the needs of the ever increasing population of big cities like London and Glasgow demanded that priority in electrification be given to suburban schemes which were carrying some of the heaviest traffic in the world.

We are fortunate in having a good power supply system which has not been adversely affected either by the unbalance due to single-phase loads or to the effects of harmonics arising from the use of rectifiers to supply our DC traction motors. The traction load ($^1/_2$ hr. maximum demand) nowhere exceeds 1.5% of the short circuit power available at a supply point; no particular precautions have been taken except to arrange that different phases are used at adjacent supply points although in our case this may not have been necessary.

The importance of designing power supply transformers capable of withstanding the short circuits inevitable with electric traction has been demonstrated on those sections of line where these have been present to an abnormal extent, equal in certain cases to what would normally be expected in the whole life of the plant concerned.

Both types of circuit breaker in use, namely, minimum oil and bulk oil, have behaved excellently. So has the impedance protection system but there have been a few occasions when quicker back-up would have been useful and modifications are being made to achieve this. It has, for example, been decided to make greater use of the spare pilots available in the railway telecommunication cables to provide intertripping between the ends of feeders close to supply points with high fault levels. This is the more necessary in our complicated railway system. It is impracticable for us to disconnect a whole supply to isolate a fault, and then restore all but the faulty section, as it is essential to maintain supply to all except the actual

single line section on which the fault has occurred. Every electrification, of course, has its particular characteristics in regard to this matter and apart from a relative immunity to lightning, our power supply equipment has probably been tested as severely as any and warranted our faith in it.

This is also true of our 25-kV track feeder cables for which mass impregnated paper insulated cables have been mainly used. Both aluminium and copper have been successfully used for 25 kV incoming 2-core concentric cables up to 550 m² copper cross section and equally good results have been obtained with oil pressure and gas pressure cables.

The voice frequency supervisory equipment for the control of circuit breakers has functioned perfectly. This equipment is of two makes and certain compromises were needed to provide compatibility of one with the other: transistors have been extensively used in both systems and have been one factor which permitted the use of mimic diagrams formed of plates 25 mm square to permit individual control from a diagram which can readily be adjusted for later additions to the lines to be electrified.

The Romford Control Room, in which two operators control over 200 circuit breakers feeding 460 single track km supplying over 250 motor coach sets, has proved to be impracticable and extensions will increase the length under control to over 600 km next year.

Our opinion that the normal UIC clearance, 270 mm static and 220 mm passing, would be satisfactory, in spite of our climate and a considerable continuing steam-hauled traffic, has been vindicated. In fact, we have made and are continuing experiments which we expect will prove that we can reduce the clearance for 25 kV, when desirable on grounds of economy, to 203 mm static and 152 mm passing. This will materially reduce the occasions on which it will be necessary to have recourse to 6.25 kV. It will thus simplify our train equipments and reduce the cost of power supply. Our opinion that 101 mm static clearance and 76 mm passing clearance, normal for 1500 v DC traction, would be adequate for 6.25 kV has also been proved correct. We have, however, had some trouble with lines being earthed by birds and are now using auxiliary insulation when possible to reduce this nuisance.

Our novel, light, well galvanized, structures, mass-produced by the welding of rod and light angles, have been successful and also the use of porcelain insulators subject to bending stresses. This construction has allowed us to have mechanical as well as electrical separation of the

Continued

L'électrification des Chemins de fer britanniques

Appliquant une partie de leur programme de modernisation, les Chemins de fer britanniques remplacent le courant continu de 1500 volts par du courant alternatif de 25 kV—et, dans certains cas, de 6,25 kV—et 50 périodes. Depuis 1956, année où ils décidèrent d'introduire le courant monophasé à haute tension et à fréquence industrielle, ils ont équipé en conséquence et mis en service 1300 km de ligne, 64 locomotives de 3300 CV et 396 rames automotrices. Jusqu'au 8 août 1961, 21 millions de km ont été parcourus par les véhicules moteurs en question, dont 96% par les rames automotrices. On électrifie actuellement en fréquence industrielle la ligne Londres–Crewe; on espère aussi que le même genre d'électrification sera chose faite en 1966 sur les lignes Londres–Liverpool et Londres–Manchester. Nous publions ci-contre le résumé d'un exposé de M. Broughall, présenté récemment à la conférence des Chemins de fer fédéraux brésiliens, à Rio de Janeiro. L'orateur, qui décrit les expériences des Chemins de fer britanniques lors de leur passage au courant monophasé à fréquence industrielle, recommande, bien que ceux-ci aient été obligés de choisir deux sortes de tension, l'application totale et inconditionnelle du courant de 25 kV.

Die Elektrifikation der Britischen Bahnen (BR)

Die BR gehen, als Teil ihres Modernisierungsprogrammes, vom 1500-Volt-Gleichstrom über zum 50-Perioden-Wechselstromsystem mit einer Spannung von 25 kV bzw. 6,25 kV. Seit ihrem Beschluss vom Jahre 1956, Einphasenhochspannung mit Industriefrequenz einzuführen, sind eine Strecke von 1300 km, 64 Lokomotiven zu 3300 PS und 396 Triebwagenzüge entsprechend ausgerüstet und dem Betrieb übergeben worden. Bis 8. August d.J. haben die in Frage kommenden Triebfahrzeuge 21 Millionen km, wovon 96% in Triebwagenzügen, zurückgelegt. Die Elektrifizierung der Linie London-Crewe mit Industriefrequenz ist in Arbeit und die BR erwarten, dass bis 1966 auch die Linien London-Liverpool und London-Manchester auf diese Art ausgerüstet sein werden. Vorliegender Artikel ist die Zusammenfassung einer Rede, die Mr. Broughall vor kurzem an der Konferenz der Brasilianischen Bundesbahnen in Rio de Janeiro gehalten hat und worin er die Erfahrungen der BR mit dem Uebergang zur Einphasenindustriefrequenz näher beschreibt. Obschon die BR gezwungen wurden, zwei Spannungen einzuführen, empfielt Mr. Broughall die unbedingte, durchgehende Anwendung des 25-kV-Systems.

Electrificación de los Ferrocarriles Británicos

Como parte de su programa de modernización los ferrocarriles británicos han convertido la tracción eléctrica en ciertas áreas de 1500 V. C.C. en 25 kV C.A. 50 períodos con 6.25 kV. Desde 1956, año en que se decidió a convertir la tracción en electrificación de alta tensión monofásica de frecuencia industrial, se han equipado 1300 km de vía y se han comprado 64 locomotoras de 3300 HP y 396 automotores con 2 o 3 remolques. El 8 de agosto estas unidades habían recorrido 21 millones de km, las ramas automotrices 96%. Actualmente se trabaja para electrificar la línea de Londres a Crewe. Hacia 1966 los BR esperan terminar la electrificación en frecuencia industrial de las líneas Londres-Liverpool y Londres-Manchester. Este artículo—resumen de un discurso dado por el Sr. Broughall en la reciente conferencia de los FC Federales Brasileños—trata de la experiencia de los BR. Aunque se ha impuesto a los FC británicos un sistema de dos corrientes, el Sr. Broughall recomienda sin restricción alguna un sistema donde se pueda utilizar 25 kV por todo.

tracks. This is a particularly desirable feature on our lines where the traffic is continuous throughout the day and sometimes throughout the night so that the opportunities for day-time maintenance are very restricted. Porcelain insulators have proved to be vulnerable to deliberate damage by stone throwing. Particularly in bad weather in vicinities where there are many steam locomotive movements, they have fractured in flash-over. In such localities, we are now fitting guard rings and spark gaps. We attach greater importance to the development of resin bonded glass-fibre insulators and to the use of this material for section insulators. To be successful, they must be fully resistant to the direct abrasion of the pantograph and capable of standing the imposed electro-mechanical stresses and occasional power arcs in the same way as the contact wire which they displace. After six or seven years of intensive development, the present designs indicate that these objectives are now capable of realization. It begins to be possible in fact to use these new materials with some, if not yet with the same, assurance, as when employing materials that have been known for many decades. For over a year in the contact line and elsewhere at 25 kV there has not been a single case of failure of a P.T.F.E.-protected glass-fibre insulator from any cause whatever, nor has it been necessary even under the most polluted climatic conditions to carry out any cleaning or other maintenance. Such savings and the other advantages mentioned will more than compensate for some present additional cost.

Reference is made to pantograph bounce and poor current collection in Brigadier Langley's second interim report. It should be appreciated that this only occurred at isolated places in the initial stages. Corrective measures have now been applied which have virtually eliminated the hard spots on the overhead equipment in question, which was of the fixed, i.e. not weight tensioned, type. It may be agreed that the establishment of virtually sparkless current collection at both 25 and 6.25 kV by one design of pantograph from overhead equipment varying from 0.75 sq. in. (480 mm²) cross section compound fixed to 0.22 sq.in. (142 mm²) plain catenary at speeds of 121–145 km/h is a vindication of the fundamental design of both pantograph and overhead equipment. In particular, we are very pleased with the performance of our graphite collectors. They promise to reduce maintenance and prolong the life of the cadmium copper contact wire.

The locomotive fleet comprises 100 3300-hp locomotives type Bo-Bo not to exceed 80 tons in weight to perform certain specified duties. The multiple-unit trains are made up of 3 or 4 coaches, depending on the severity of the service. The motor coaches of these units each have 4 axle-hung motors of about 210 hp rating.

The use of direct current series motors was standardized for both locomotives and motor-coach trains. The 300 motors for three series of locomotives, of which a total of 75 have been ordered, are built to one design; they are of 800-hp B.S. rating (1040-hp UIC rating). They have now run an aggregate of over 300,000 km without a single motor failure: their commutation in service is as good as their test bed performance. Brush life, in spite of a 30% ripple, is of the order of 5000 km/mm of wear. These have been used with an Alsthom flexible drive.

Similarly, excellent performance, without a single motor failure, after an aggregate of over 2.5 million km has been obtained from another series of over 450 motors of 210 hp by the same maker. These are axle-hung motors on motor-coach trains with a similar value of ripple.

They work at 975 volts and have a shallow laminated ring inside the main yoke casting to keep the interpole flux in phase with the armature current. The 6-pole locomotive motors have lap windings and are insulated with Class H material. Every component of this insulation has been selected after thorough scientific analysis based on experience dating back to 1953 when prototype trolley-bus motors were so insulated for the first time.

The motor-coach motors have wave windings and are class B insulated; particular care has been taken to seal the insulation against brake shoe dust for these motors are directly cooled without filters by air drawn from beneath the coach.

Bearing in mind that contracts were placed in 1957 it is not surprising that most of the fleet uses mercury rectifiers. With one possible exception, these have given very satisfactory service although there were initial difficulties with the shutters forming part of the ventilation arrangements of another series. What is considered more important is the satisfactory performance of our semi-conductor rectifiers; 45 motor-coach equipments with germanium rectifiers were ordered in 1957 and many have been in service for over a year. So well did they perform that the 40 locomotives now building at our Doncaster Works are being equipped, some with germanium and some with silicon rectifiers instead of mercury arc rectifiers originally ordered. Eight of these have been delivered and the four that have been commissioned have run 8000 km without difficulty. Among the reasons for this now well established preference, apart from eliminating all risk of back-firing, is the simplification that is possible by omitting excitation and ignition circuits and the gadgetry associated with pre-heating circuits. In addition, semi-conductor rectifiers take up less room to such an extent as to permit the installation of a substantial (1000 kW) rheostatic brake within the weight and dimensions previously needed for mercury arc rectifiers. Rolling stock of all kinds powered with semi-conductor rectifiers has now run nearly five million km without failure of the rectifier as such. Included in this total are four types of equipment, including silicon rectifiers, in none of which have we found it necessary to use a short circuiting switch to protect the rectifier, due, it is believed, to a cautious policy in grading the cells and to choice of the right number of cells of suitable quality—an essential requirement in using semi-conductor devices.

In a few months we shall have our first locomotive using static devices for control of voltage to traction motors in lieu of the contactors at present associated with the tapping of the transformer secondary. The arrangement, which has already completed its works test satisfactorily, comprises silicon rectifiers instead of ignitrons, a transductor tap-changing scheme, and rheostatic braking. The essential feature of this scheme is that two adjacent transformer tappings are connected to the load simultaneously, each connection having a self-excited transductor in series. A transductor, of course, is a magnetic core with windings and is a maintenance-free item with no moving parts. By controlling the current in the low-power control windings of the transductor connected to the higher of the two taps the load current can be steadily transferred from the lower to the higher tap, or vice versa, and therefore the traction motor voltage can be raised or lowered smoothly from zero to full value.

This type of control scheme has great advantages. First, the smooth control of traction-motor current allows an effective increase in adhesion of 10% or more, so that a 73-ton locomotive can start the same train as an 80-ton locomotive with old-fashioned tap-changing. Secondly, the characteristics of the locomotive, with speed as the ordinate and tractive effort as the abscissa, are very much flatter than with ordinary tap-changing. This again favors better adhesion, because the speed of a slipping wheel will be considerably reduced. Thirdly, only the magnetizing current of the transductors, which is less than 10 amps., has to be interrupted by

the power contactors; therefore, arc chutes, blow-out coils, high-speed mechanisms, surges, ionization and so on are eliminated. Fourthly, since the scheme is essentially one of low-voltage control, it has the inherent advantages of the best possible efficiency and power factor. Fifthly, the good performance in energy consumption is maintained unchanged for both the 6.25 kV and 25 kV overhead line voltages. With a 25-kV tap changer, on the other hand, the energy requirements for a given performance are worse on the 6.25 kV than on the 25 kV overhead line.

This satisfactory performance of advanced technique is a vindication of the view that the AC system, being in its initial stages of development, is the system which holds most promise of improvement from the important research and development projects now actively in hand.

Transformers have long been accepted as completely reliable apparatus and it was not considered that they would introduce any hazard into electric rolling stock. Such has in general been our experience, but there have been exceptions. These have given rise both to some controversy and to a very thorough analysis which will be of great value for the future. There have not been any failures of the four types used on locomotives. There has been no failure of the transformers used on 112 equipments which have seen the longest and most arduous service in the Eastern Region, including about 25,000 automatic transitions from 25 to 6.25 kV and vice versa, and including one occasion on which, due to error, 25 kV was accidentally applied to 6.25 kV. The rolling stock incorporating these transformers has worked over 11 million km without a transformer failure.

The primary windings of all our transformers in which speed control is by tapping the secondary, are built in four sections connected in series for operation at 25 kV and in parallel for operation at 6.25 kV. The transition is automatic and is made at speed under load.

There has been no case of failure of the primary windings. The secondary windings which supply the rectifiers and the tertiary windings which supply the auxiliaries, have taken a variety of forms, some of which have been less successful than others.

There have not been any failures of transformers using what we know as the inter-leaved pancake winding. The major series of failures were those on the Glasgow line where transition from 25 to 6.25 kV is the most frequent. It must remain open to question, pending the issue of Brigadier Langley's final report, to what extent the failures that have occurred on secondary windings of the helical type are due to the use of that type of winding and how far they are due to other circumstances, including the transition from one voltage to the other. Certain it is that our experiences have led to a great increase in knowledge in the effect of short circuits on transformer windings, which will be of value to all when it is possible to narrate it. For the moment it must suffice to say that our experience shows at least one way of ensuring that transformers are trouble-free as we always expected they would be.

British E3001 electric locomotives were designed by AEI Ltd. with mechanical parts sub-contracted to the Birmingham Railway Carriage and Wagon Co., Ltd.

All the motor-coach trains have speed control by tap changing on the secondary winding; two of the four types use electro-pneumatic contactors of the conventional DC type adapted for AC working; the others use cam shaft controllers. None has given any serious trouble; neither arrangement yet shows any decided advantage.

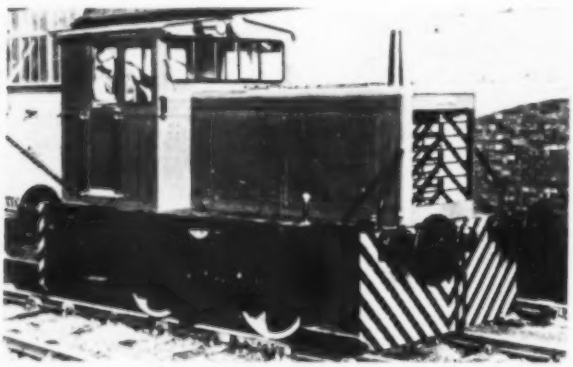
Two of the five types of locomotives have speed control by tapping primary winding and three by tapping the secondary. All are now giving satisfactory service. Some have required modification; in particular it was necessary to locate and eliminate stray fields in one L.T. tap changer and to re-design the contact system of a novel form of H.T. tap changer. Several prototypes are under test, including one using a contact sliding up and down the secondary. The possibility of using a variation of the voltage regulator to give notchless control has been investigated and rejected on the score of weight and bad power factor.

The intention expressed in the specification for these equipments was to reduce protective devices to the minimum, but this objective has not yet been realized. Whilst some equipments are now considered to be over elaborate others have needed additional apparatus. The motors of one fleet of motor coaches suffered considerably from over-voltages, particularly when working in the 6.25-kV areas. These were due to transients developed by the rapid cut-off of the air blast circuit breaker with which every locomotive and motor coach is equipped. Most of this trouble disappeared as soon as a good earth was provided near the motors. The remainder will doubtless cease when capacity/resistor circuits have been fitted to absorb the over-voltages in question.

Investigation is proceeding along two lines. The more obvious is preventative action to avoid damage, such as that mentioned above. This has already been included in the design of other equipments where no trouble has been experienced. The other is to modify the characteristic of the circuit breaker so that, without reducing its fault clearing capacity or increasing its operating time, the over-voltages imposed in the circuit are materially reduced. One of our Consulting Engineers, Messrs. Merz & McLellan, who have been assisting in the solution of this problem, have recently patented a special form of resistance switching. This shows promise of reducing these over-voltages from values lying between 50 and 70 kV to values of the order of 30 kV by means of a simple modification of the existing circuit breakers.

It will be apparent, of course, that the effects of these over-voltages are relatively more severe when the 6.25-kV circuit is in use and no trouble has occurred on 25-kV operation. Capacity resistance networks are, of course, essential where semi-conductor rectifiers are used.

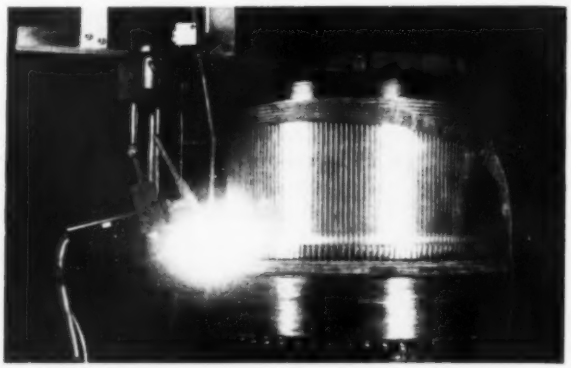
Products of Interes



Diesel Locomotive For Industry

Locomotive diesel-hydraulique 4/4 de 24 tonnes.
Eine 4/4 diesel-hydraulische Lokomotive von 24 t.
Locomotora diesel-hidráulica, 24 toneladas, 0-4-0.

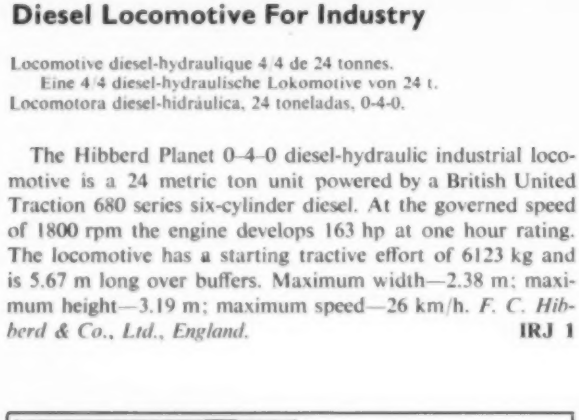
The Hibberd Planet 0–4–0 diesel-hydraulic industrial locomotive is a 24 metric ton unit powered by a British United Traction 680 series six-cylinder diesel. At the governed speed of 1800 rpm the engine develops 163 hp at one hour rating. The locomotive has a starting tractive effort of 6123 kg and is 5.67 m long over buffers. Maximum width—2.38 m; maximum height—3.19 m; maximum speed—26 km/h. *F. C. Hibberd & Co., Ltd., England.* **IRJ 1**



Semi-Automatic Spot Welding

Soudure prolongeant l'existence de moteurs de traction transformés.
Schweissverfahren verlängert Lebensdauer umgebauter Triebmotoren.
Nuevo proceso de soldadura para la renovación de motores.

A Tungsten inert gas welding process for increasing the reliability of rebuilt traction motors will, the manufacturer claims, help railways realize more miles per maintenance expenditure. The semi-automatic welding method is used for making the connection between armature coil lead and commutator riser. This results in an all copper joint, providing better protection against high temperature damage. *General Electric Co., USA.* **IRJ 3**



Mobile Power Station

Génératrice ultra-moderne d'électricité.
Neueste Elektrizität-Erzeugungseinrichtung.
Tipo avanzado de equipo generador de electricidad.

An advanced type of electricity generating equipment—a development of the transportable 3 Megawatt turbogenerator (p 54, IRJ, October 1961)—is now available. The complete unit—gas turbine power plant, generator and controls—is housed in a single 3 Megawatt "power package" which can be transported by rail on a flat car. Previously, separate units were used for generation and control. *Bristol Siddeley Engines Ltd., England.* **IRJ 2**

Commutator Copper Alloy

Alliage contre la déperdition de force aux segments de commutateurs.
Legierung löst Kraftverlustprobleme der Kommutatorsegmente.
Aleación soluciona el problema de la pérdida de fuerza de colectores.

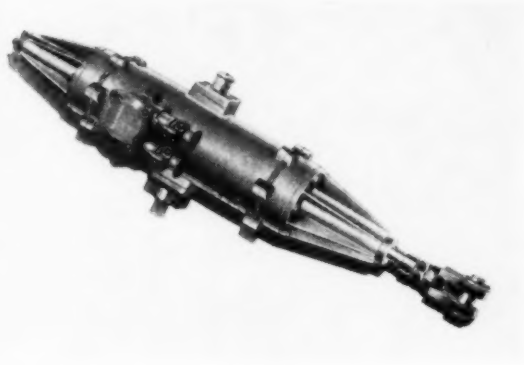
A copper-silver alloy—designated Combarloy—is said to overcome the problem of commutator bars which lose their hardness and tensile strength. The method sacrifices none of the properties of high conductivity copper and the addition of a small amount of pure silver—too small to have any measurable effect on electrical conductivity—renders cold drawn copper completely stable as far as hardness is concerned. *Thomas Bolton & Sons Ltd., England.* **IRJ 4**

Extruded Coated Electrode

Electrodes en aluminium pour tout point de soudure.
An allen Schweisstellen verwendbare Aluminium-Elektroden.
Electrodo de aluminio para soldadura.

An aluminium electrode with an extruded coating for all-position-welding, with direct current reverse polarity, of aluminium plate, sheet and casting, is now available. The Airco 43 electrode operates smoothly while providing a dense, low spatter deposit. It features low amperage application, easy slag removal and provides tensile strength yields up to 28,000 psi. Uses include welding of tanks, railings, and truck construction and repair. *Air Reduction Company Inc., USA.* **IRJ 5**

...es from Railway Suppliers



Push-Pull Electric Actuator

Démarreur électrique à mouvement de va-et-vient positif.
Elektrischer Anlasser mit positiver Pendelaktion.
Arrancador eléctrico con acción reversible positiva.

A new electric actuator consists of an electric motor in which the turning of the rotor is changed into a push-pull motion by means of a screw. Models are available to suit any three-phase 50-cycle system up to 700 volts and are designed to give between two and ten starts per minute depending on the length of stroke and size of motor. More frequent starting can be obtained for short-time rated machines. *The Electric Actuator Co., Ltd., England.* **IRJ 6**

Elapsed Time Meter

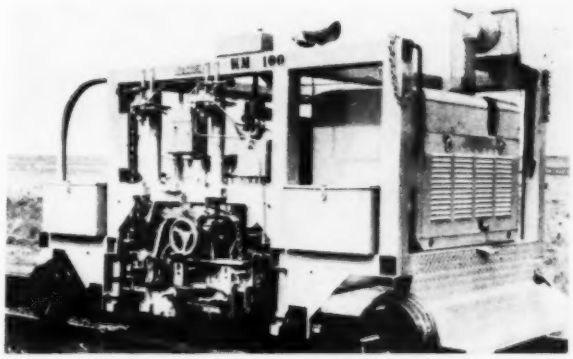
Nouvel appareil de mesure de la durée du matériel ferroviaire.
Neuer Apparat misst Betriebsdauer des Rollmaterials.
Nuevo contador indica cuánto tiempo el equipo se ha utilizado.

An elapsed time meter for recording how long a piece of equipment has been in use has been developed. It can be applied to any equipment used intermittently and on which planned maintenance or a time log is required. It will register up to 9999.9 hours in grades of 0.1 hour. Operation is on AC supply in the voltage ranges 100–125, 200–250, and 400–440. The frequency can be 50 or 60 cycles. *The English Electric Co., Ltd., England.* **IRJ 7**

Cutter Profile Developer

Nouvel appareil de précision pour relever le terrain.
Neuer Apparat gewährleistet genaue Profilfräsung.
Dispositivo que elimina errores en el corte de perfiles.

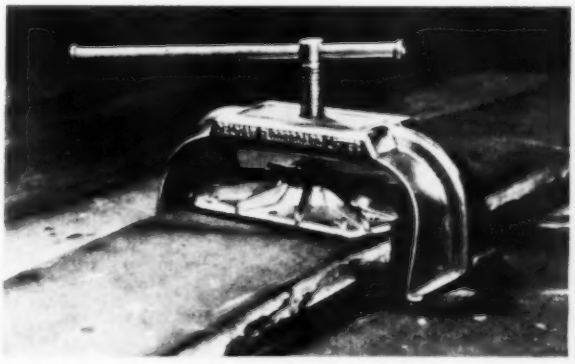
An English firm has been closely investigating the various factors involved in machine setting and has now introduced a cutter profile developer, type ZG which, it is claimed, provides the first practical solution commercially available to this problem. The device, named Pro-Set, promises to create a major change in tool room practice by eliminating trial and error in cutter profile developing and grinding. *Thomas Robinson and Son Ltd., England.* **IRJ 8**



Drill And Saw Maintenance Unit

Machine économique d'entretien de la voie.
Kostensparende Bahnunterhaltsmaschine.
Máquina económica para la conservación de la vía.

The Krop-master railway maintenance-of-way-machine is self-propelled up to 32 km/h and has built-in jacks to assist in setting off the track onto a prepared set-off. The unit will drill multiple holes in rail for angle bars using a "fixed" position head to insure alignment. A hydraulic feed rail-saw can be attached so that the rail may be drilled and sawed simultaneously in track. *Machinery Division, Racine Hydraulics & Machinery Inc., USA.* **IRJ 9**



Low-Cost Floorboard Lifters

Procédé simple et économique de soulever les planchers.
Einfaches und billiges Bodenbretter-Hebeverfahren.
Método sencillo para quitar tablas de entarimar.

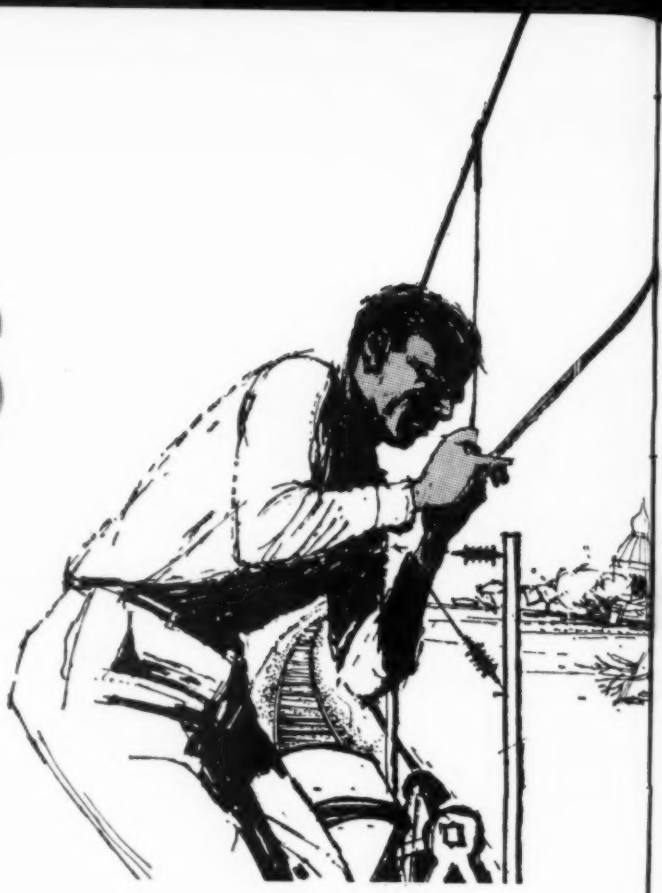
The Delway-Rapid floorboard lifting system provides a simple, clean method of lifting floorboards at low cost and with maximum recovery in material. The system is based on three main pieces of equipment: Tongue Cutter model T.C. 1.; Floorboard Lifter, model F.L.A. and Large Area Floorboard Lifter, model F.L. 88. The three components are manufactured from rustproof, high quality, light-weight aluminium alloy. *Explosive Power Tools Ltd., England.* **IRJ 10**

INDIAN RAILWAYS

1500 track km. of A.C. Electrification

by the

BICC GROUP

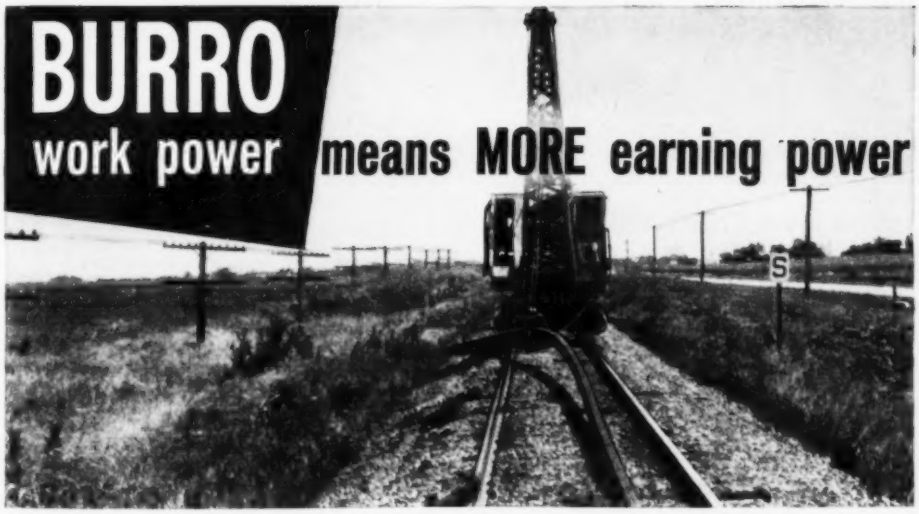


The BICC Group has now been awarded its third successive contract since 1958 from the Indian Railway Board for 25kV 50 cycles electrification systems. The placing of the third order—380 track kilometres of the more complex Calcutta suburban section of the Eastern Railway system—reaffirms the Board's confidence in BICC. The first of these contracts, comprising 640 track kilometres on the South Eastern Railway's Tatanagar-Rourkela and Dongoaposi line, is now in commission forming a vital supply link for India's developing industries.

For half a century the BICC Group has been designing, supplying and erecting overhead traction equipment. Our experience covers all types of systems in every continent including the installation of important A.C. suburban and main line schemes for British Railways. Our service to World Railways covers the supply and installation of cables for power, telecommunication and signalling in addition to the complete range of overhead traction equipment.

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 Bloomsbury Street, London, W.C.1, England

BURRO
work power means MORE earning power



Burro Crane, with threader suspended from boom of the crane to guide the rail, shifting new welded rail from the shoulder to the center of track.

Model 40 Burro Locomotive Crane Ditcher with long digging radius to permit starting ditch ample distance from track. This Model 40 Burro not only digs ditch and loads both near and far ends of cars, but also hauls its own cars with its own power.

On the line, in the yards, or Stores Department – a Burro does the job fast, efficiently, and profitably. Fast travel speeds and heavy draw bar pull enable the Burro to go to the job in a hurry – and even haul its own cars with it. Once on the job, the Burro wastes no time getting the job done with hook, magnet, tongs, bucket or dragline.

CULLEN-FRIESTEDT CO.,

1314 S. KILBOURN AVE. · CHICAGO 23, ILL., U.S.A.

Represented in Canada by:
SYLVESTER STEEL PRODUCTS CO., LTD.
LINDSAY, ONTARIO

Write for Bulletins and more information about Burro Cranes

ADVERTISERS' INDEX

DECEMBER 1961

Alco Products, Inc.	29—32 incl.	Knorr-Bremse GMBH	—
Baldwin-Lima Hamilton Corporation	—	Manganese Bronze & Brass Company, Ltd.	—
Bell Punch Export Company, Ltd.	16	Matisa Equipment Corp.	—
Bolton Gate Company, Ltd.	—	Metropolitan-Cammell Carriage & Wagon Co., Ltd.	4
Bolton & Sons, Ltd., Thomas	—	Miner, Inc., W. H.	—
Bristol-Siddeley Engines, Ltd.	8	National Castings Company	—
British Insulated Callender's Cables Ltd.	56	Pirelli-General Cable Works, Ltd.	14, 15
California Texas Oil Company	Back Cover	Plasser & Theurer	—
Cardwell Westinghouse Co.	—	Poor & Company	—
Commonwealth Sales Corporation	—	Railroad Rubber Products Co.	—
Cossor Communications Company Ltd.	—	Rails Co.	—
Cowans Sheldon & Company, Ltd.	17	Remington Arms Company, Inc.	—
Crompton-Parkinson, Ltd.	3	Rolls-Royce	—
Cullen-Friestedt Company	57	Schorling and Company	—
Davey, Paxman & Co., Ltd.	16	SES Maatschappij Voor Spoorwegbovenbouw	—
Deutsche Waggonfabriken	Inside Front Cover	Sentinel Ltd.	—
Fairmont Railway Motors, Inc.	—	Société Industrielle Des Métaux Manufacturés S. A.	—
Foster International Corporation	—	Sprague Devices, Inc.	—
Ganz Mavag	—	Spray Products Corporation	—
Garlock, Inc.	—	Standard Telephone & Cables, Ltd.	—
General Electric Company	—	Stream-Line Filters, Ltd.	—
General Motors Overseas Operations	10	Stucki Company, A.	—
General Railway Signal Company	—	Taylor & Hubbard, Ltd.	—
General Steel Industries, Inc.	—	Tempered Spring Company, Ltd., The	—
Henschel-Werke	—	United States Steel Export Company	—
Hitachi Ltd.	Inside Back Cover	United Steel Companies (Steel, Peech & Tozer Div.)	—
Jackson Vibrators, Inc.	6, 7	United Steel Companies (Workington Division)	—
Joyce-Cridland Company	13	Vapor International Corporation, Ltd.	—
Kango Electric Hammers, Ltd.	—	Werkspoor N.V.	12
Kershaw Manufacturing Company	—	Western Railroad Supply Company, Q and C Division	—
Kisha Seizo Kaisha, Ltd.	—	Whiting Corporation	—

WORLD POLL

Capital Expenditures II

Since publication of the World Poll on capital expenditures in the Nov. issue the following have been received.

INDIAN GOVERNMENT RAILWAYS

Total: 2,600 million rupees*

Rolling stock	928.9 mil. rupees
New line construction	458.1 mil. rupees
Electrification	112.4 mil. rupees
Signaling and Safety works	92.9 mil. rupees
Bridges and buildings	92.9 mil. rupees
Other expenditures	914.8 mil. rupees

* 100 Rupees = $22 US.

Figures are for the current fiscal year 1961—1962.

JAPANESE NATIONAL RAILWAYS

Total: 192,470 million yen*

	No.	
Electric locomotives	57	3,916 mil. yen
Diesel locomotives	61	2,887 mil. yen
Passenger cars		
Electric railcars	710	15,025 mil. yen
Diesel railcars	567	12,520 mil. yen
Passenger cars	90	1,297 mil. yen
Freight cars	9,640	13,931 mil. yen
New line construction	17 km	7,544 mil. yen
Double tracking	138 km	18,292 mil. yen
Other improvement to track		7,151 mil. yen
Electrification		9,075 mil. yen
Signaling		2,626 mil. yen
Communications		1,149 mil. yen
Yard and terminal facilities		14,009 mil. yen
Shop and repair facilities		1,852 mil. yen
Bridges and buildings		4,881 mil. yen
Other improvements		
Construction of New Tokaido Line		43,768 mil. yen
Electrification		2,456 mil. yen
Other expenditures		30,091 mil. yen

* 100 yen = $ .28 US.

Figures are for the current fiscal year ending 31 March, 1962.

SOUTH AUSTRALIAN RAILWAYS

Total: £A2,500,000*

Locomotives	£1,075,000
Passenger cars (including rail cars)	£ 71,000
Freight cars	£ 599,000
New line construction	£ 90,000
Major track improvements	£ 80,000
Signaling } Communications }	£ 154,000
Yards and terminals	£ 45,000
Shop and repair facilities	£ 137,000
Bridges and buildings	£ 264,000
Other expenditures	£ 85,000
Housing	£ 30,000
Total	£2,630,000
Less material from stock	£ 150,000
	£2,480,000
Plus flotation and discount charges	£ 20,000
Total capital expenditures	£2,500,000

* £A 100 = $225 US.

Figures are for the current fiscal year 1961—1962.

After Hours with

Jim Lyne

SLOW TO INNOVATE?—I was recently asked why railroads were slow to adopt innovations. I denied that they are slow. On the contrary, they innovate to the limit of their financial ability—wherever securing agreements with other railroads or regulation do not handicap them. For example, consider the rapidity with which diesels, mechanized track maintenance, ATC, electronic yards, computers have been taken on —no severe inter-railroad or regulatory questions being involved. On the other hand, changes in standard safety equipment, in car design, in automatic brakes, in rates—these progress more slowly because inter-railroad and regulatory support are a prerequisite.

LABOR'S PROPRIETARY RIGHTS — Another big railroad problem, seemingly universal in its impact on railway administrations, is the insistence of labor unionists on the proprietary rights of an employee in his particular job. In a period of readjustment and transition, it is impossible to avoid changes in the nature and location of railway work—and unionists who seek to prevent such changes (or permit them only under onerous and costly conditions) are really undermining the long-run job-providing opportunities of their enterprise.

When automobiles began to replace horses, there was a decline in employment among farriers—but who ever heard of a farrier who starved to death because of the need to alter his occupation? Railway employees, certainly, are as resourceful as farriers in adapting their skills to different work.

BEECHING'S PILLS—Dr. Richard Beeching, the chemical manufacturer who now heads the British railways, does not seem to have fallen into a bed of roses. Chairman Ed Hill of the Eastern Railroads Traffic Association in the US has just returned from Britain and has handed me a sheaf of clippings from British papers, indicating that the good doctor has got his hands full, in his assignment to eradicate the red ink.

He has prescribed such standard medicine as eliminating thin-traffic branch lines, raising rates (including commuter fares) and reducing forces. The sensational press is trying to make something of Dr. Beeching's own salary—which is generous by British standards ($67,000), but is exactly what he was getting in the industry job he was induced to leave to take on his railway assignment.

SHUNTING—I am curious to know what is the smallest number of men actually used to perform shunting operations. In North America, the number is usually four or five—two men on the locomotive, and two or three shunters. I would suppose that some of these operations could be done satisfactorily with three or even two men—one man on the locomotive and one or two shunters. Or am I over-imaginative?

Diesel Hydraulic Bus, Egyptian Railways

1,560 BHP Diesel Electric Locomotive, Taiwan Railway Administration

100% Hitachi is 100% Reliability

Indestructible service puts Hitachi locomotives in a class of their own. This Hitachi reliability is on record in the long history of Japan's vast railroad industry as well as in the development of rail progress in countries around the world.

Whatever your particular system — Diesel, Diesel-electric, AC, DC, or combined AC-DC — 100% Hitachi-designed, Hitachi-engineered, Hitachi-manufactured locomotives are your guarantee of 100% reliability, efficiency and economy in progressive rail service.

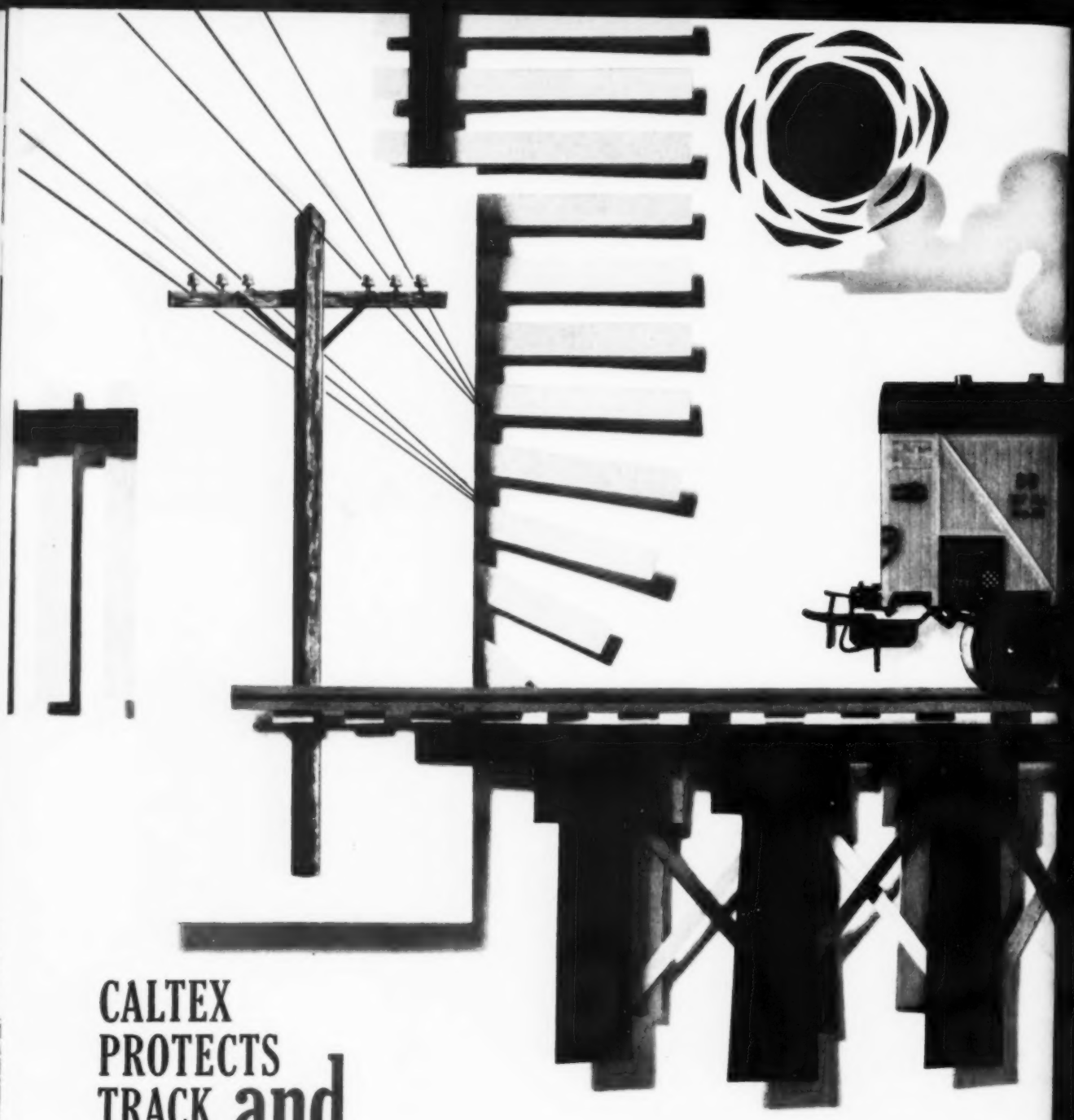
▲ 3,000 DC Electric Locomotive, Indian National Railways

◀ 1,100 BHP Diesel Hydraulic Locomotive, Japan National Railways

Hitachi, Ltd.

Tokyo Japan

Cable Address: "HITACHY" TOKYO



CALTEX PROTECTS TRACK and BUDGET

Low-Cost Protection for Pilings and Poles. Caltex Protexacote is a highly durable combination of asphalt, asbestos and wood preservatives. When applied to poles and pilings, it seals out water, air, bacteria and fungi, and seals in the original wood preservative. Particularly effective at ground level and below, where the severest damage usually occurs, it is also an excellent sealant for the tops of poles and the ends of crossarms. It can be readily brushed or sprayed on at high temperatures.

Long Life for Ties at Minimum Cost. Caltex Texticote waterproofs wood ties at rock-bottom cost and prevents cracking and splitting. It is an extremely durable coating that cannot check, chip or become brittle. It will stay on even under the severest vibration or shock, especially when coated with gravel or crushed stone. For complete information, write or telephone your nearest Caltex office.

CALTEX

RAILROAD LUBRICANTS